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ВЫСШЕГО ПРОФЕССИОНАЛЬНОГО ОБРАЗОВАНИЯ

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Учебное пособие
для студентов Естественно-технического факультета
специальности «Физические процессы горного
производства»

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СОДЕРЖАНИЕ

ВВЕДЕНИЕ

Учебное пособие представляет собой курс технического английского языка для студентов, обучающихся по специальностям, связанным с горным делом и нефтепоисковыми работами.

Учебное пособие разработано в соответствии с требованиями ФГОС ВО и ставит целью формирование у студентов готовности к коммуникации в устной и письменной формах на русском и иностранном языках для решения задач профессиональной деятельности.

В результате освоения представленного в пособии материала студенты должны:

Знать

– специальную лексику на уровне, достаточном для свободного использования английского языка в профессиональной деятельности;

– основные способы работы с аутентичной литературой по специальности;

– основные способы поиска недостающей информации.

Уметь

– работать со специальной литературой на английском языке, используя различные стратегии чтения (выделение основной идеи текста, извлечение интересующей информации, детальное понимание содержания);

– строить грамматически правильно оформленное, целостное, логичное и связанное монологическое высказывание;

– решать коммуникативные задачи, необходимые для ведения диалога по специальной тематике.

Владеть

– приемами и способами самостоятельной учебной деятельности по приобретению и развитию речевых умений и навыков;

– навыками коллективного взаимодействия, умениями работать в паре и группе;

– навыками профессионального самосовершенствования и саморазвития.

Учебное пособие состоит из 10 модулей (Units), затрагивающих основы геологии, минералогии, геофизики и геодезии. Материал данных модулей располагается в порядке возрастания смысловых и языковых трудностей.

Каждый представленный в пособии модуль включает в себя:

– лексику, предназначенную для активного усвоения;

– послетекстовые упражнения, направленные на снятие фонетических и лексико-грамматических трудностей, которые могут возникнуть у студентов при работе с текстом;

– текст по специальности;

– задания для подготовки самостоятельного монологического высказывания с использованием материала изучаемого модуля и привлечением дополнительной информации.

Представленные в пособии тексты взяты из оригинальных источников и относятся к научному стилю речи, которых характеризуется присутствием развёрнутых дефиниций и описаний.

Учебное пособие рассчитано как на аудиторную работу, так и на самостоятельное освоение студентами языкового материала.

UNIT 1

Read the text

GEOLOGY

Geology is the study of the origin and evolution of the earth and its inhabitants, as disclosed by the study of the rocks (formations) and fossils. The word “geology” is derived from the Greek “ge” meaning “earth”, and “logis” meaning “discourse” and was first used in approximately its present sense in 1661.

The great mass of detail which constitutes geology is classified under the headings:

Physical geology which is concerned with the physical processes that operate on and within earth –the processes that have given the rocks of the earth’s crust their composition and structure, and the forces that have shaped the landscapes we see on its surface.

Mineralogy – the science of minerals; petrology – the science of rocks.

Structural geology which is the study of the architecture of the earth in so far as it is determined by earth movements; geomorphology, which deals with the origin of landscapes and with the changes that are constantly occurring in them; historical geology – the science that traces the evolution and development of the earth and its animal and plant inhabitants with time; paleontology – the science that deals with the study of animals and plants of the geologic past; stratigraphy, the science that is concerned with the order and sequence of the rocks that make up the earth’s crust; economic geology – the application of the science of geology to the uses of man. Geology also embraces some branches of geophysics and geochemistry.

These subdivisions are not independent sciences. For example, physical geology could never have obtained its present development without the concurrent progress in paleontology. These subdivisions are, in turn, dependent upon the fundamental sciences of physics, chemistry, and biology, as well as to a certain extent, upon astronomy and the social sciences of geography and economics.

To begin a study of the earth we shall need to know something about its dimension, shape, and its outer zones. The earth is a spheroid, its equatorial diameter being 26 miles greater than its polar diameter.

Equatorial diameter	7,927 miles
Polar diameter	7,900.4 miles
Difference	26.6 miles

The earth is divided, concentrically, into a number of spheres:

– Atmosphere: a gaseous envelope which covers both the lithosphere and hydrosphere.

– Hydrosphere: water which covers only a portion of the lithosphere and is mainly confined to the seas and oceans.

– Lithosphere: the observable solid portion of the earth's lithosphere has a density less than 3, but the density of the earth is 5.52. Therefore, the interior of the earth must be denser than the outer lithic sphere.

Temperature increases 1° F for every 30 to 300 feet toward the center. Volcanic lavas suggest that temperatures as high as 1,800° F may exist not far below the surface of the earth.

(The above information was adapted from www.wikipedia.org)

1. Find English equivalents to the following:

Происхождение земли и ее обитателей, органические остатки, современное значение, круг вопросов, поскольку, порядок и последовательность пород, в свою очередь, в некоторой степени, газообразная оболочка, ряд, растительный и животный мир, недра земли.

2. Answer the following questions.

1. What does the text deal with?
2. What is defined as geology?
3. What is the word "geology" derived from?
4. What is physical geology concerned with?
5. What does mineralogy study?
6. What other geological sciences do you know? What does each of them deal with?
7. Are geological subdivisions independent sciences?
8. What can you say about the shape and dimension of the earth?
9. What are the outer zones of the earth?

10. Is the density of the outer part of the earth the same as that of its inner portion?

3. Render the following text in English:

Геология – одна из наук о Земле. Слово «геология» состоит из древнегреческих слов «ге», что значит «земля», и «логос» – «учение». Существуют и другие науки, которые изучают Землю, например, астрономия, география, геодезия, геофизика и геохимия. Однако, в отличие от этих наук, геология изучает состав, строение, происхождение и развитие земной коры и Земли и процессы, которые происходят в земной коре.

Геология делится на динамическую и историческую. Геодинамика изучает геологические процессы, действующие на поверхности и внутри планеты. Историческая геология изучает историю развития Земли, земной коры и жизни на Земле. Наука об остатках древней жизни называется палеонтологией.

Из геологии по мере её развития выделились многие науки, которые занимаются исследованием составных частей земной коры и разных процессов, формирующих и изменяющих её. Все эти науки являются геологическими.

Земная кора состоит из минералов, которые образуют горные породы. Изучением свойств и состава минералов занимаются науки кристаллография и минералогия. Минералогия изучает такое образование /генезис/ и изменение минералов.

Состав и строение горных пород изучают такие науки, как петрография и литология.

Геология связана с геофизикой и геохимией – науками, которые изучают Землю физическими и химическими методами.

4. Speak on:

1) the science of geology
2) subdivisions of geology

UNIT 2

Read the text

Minerals

The earth's crust is not a homogeneous substance. If we examine its surface we find a variety of rocks and soils which differ in color, in density, and in other characteristics. If we examine a fragment of rock or a handful of soil more closely we find that it is a mixture of different substances. However, the individual particles that make up the rocks and soils are not mixtures. Each is a distinct, homogeneous substance with definite chemical and physical characteristics. Some may be hard, transparent particles that resemble bits of broken glass; some may be dull, earthy grains; some may be tiny elastic flakes that flash brilliantly in the sun. Each of these distinct, homogeneous substances is a mineral.

Rocks and soils are aggregates of minerals. Hence, if we are to understand the origin and classification of rocks, we must learn something about the various minerals that compose them.

A mineral may be defined as a natural inorganic substance having a characteristic range of chemical composition, usually definite crystal form and exhibiting other physical properties.

Minerals may be classified according to their properties enlisted in A - F.

A. *Crystal form***.** A crystal is a solid having a definite atomic or molecular structure and bounded by plane surfaces called crystal planes. All crystal forms are classified in six systems, each of which is determined by the relation of axes, which are imaginary lines connecting the centers of opposite faces, opposite corners or opposite edges and which intersect at a single point.

1. Isometric system. Three axes of equal length. Intersect at right angles.

2. Tetragonal system. Three axes intersect at right angles.

3. Hexagonal system. Four axes. Three horizontal axes intersect at 60°. Vertical axes are longer or shorter than horizontal.

4. Orthorhombic system. Three axes of different lengths. Intersect at right angles.

5. Monoclinic system. Three axes of different lengths. Two intersect at right angles. Third axis oblique to one of the others.

6. Triclinic system. Three axes are of unequal length and all oblique to one another.

B. Cleavage. Property of minerals to split more easily in certain directions, with the development of cleavage planes. Dependent upon atomic arrangement of crystals.

C. Fracture. Property of minerals to break with curved or uneven surface.

D. Hardness. Resistance to abrasion or scratching.

E. Color. Some mineral species may include a number of color varieties.

F. Luster. Appearance of the surface of a mineral in reflected light.

The common rock minerals may be divided into three general groups: 1) Native minerals, composed of uncombined elements. 2) Mineral sulphides, chlorides, and oxides. Composed of metals or silicon, with either sulphur, chlorine, or oxygen. 3) Mineral silicate, carbonates, or sulphates. Composed of compounds of basic oxides with oxides of silicon, carbon or sulphur. The silicates are the most common rock-forming minerals. The third group is by far the most abundant, particularly silicates and carbonates.

(The above information was adapted from www.wikipedia.org)

1. Translate the following word combinations into English. Remember that nouns in common case are widely used as attributes in pre-position.

Облик кристалла, состав минерала, твердость минерала, плоскость спайности, свойства минерала, форма кристалла, плотность самородных металлов, зерна минерала, происхождение нефти, грани кристалла, ребра кристалла, поверхность плоскости, расположение кристаллов, поверхность излома, цвет минерала, разнообразие цветов.

2. Translate the following sentences into English.

1. Породы, различающиеся по цвету, плотности и другим характеристикам, составляют земную кору.
2. Отдельные частицы, составляющие породы, не являются смесями.
3. Каждая частица, имеющая определенные физические и химические характеристики, является однородным веществом.
4. Порода, исследованная в нашей лаборатории, состоит из двух минералов.
5. Все формы кристаллов, найденные в природе, делятся на шесть кристаллографических сингоний.
6. Историческая геология – наука, изучающая историю развития земной коры и органической жизни.
7. Органические остатки, сохранившиеся в породах, помогают нам понять природу (характер) прошлой жизни и ее эволюцию.
8. Свойства минералов, определенные в полевых условиях, затем тщательно исследуются в лаборатории.
9. Земная кора сложена самыми разными породами.
10. Эти породы отличаются цветом, плотностью, сцементированностью и другими чертами.
11. Некоторые породы являются однородными веществами, характеризующимися определенными химическими и физическими свойствами.
12. Другие породы представляют собой соединения различных веществ.
13. Они могут быть прозрачными или тусклыми.
14. Тело с определенным молекулярным строением, ограниченное плоскими поверхностями, называют кристаллом.
15. Формы кристаллов классифицируют на 6 кристаллографических сингоний.
16. Отношения между осями определяют каждую из сингоний.
17. Если мы знаем наиболее важные физические свойства минералов, мы можем легко их узнать.
18. Такими свойствами являются твердость, спайность, излом, цвет, блеск и другие.

3. Refer to the text do the following tasks:

1) Give the main idea of each paragraph of the text.
2) Write a summary of the text.

UNIT 3

Read the text

Mining industry (1)

The mining industry contains five main industry segments, which are defined by the resources they produce: oil and gas extraction, coal mining, metal ore mining, nonmetallic mineral mining and quarrying, and support activities for mining.

1. Oil and gas extraction segment produces the petroleum and natural gas that heat homes, fuel cars, and power factories. Petroleum products are also the raw materials for plastics, chemicals, medicines, fertilizers, and synthetic fibers. Petroleum, commonly called crude oil or just oil, is a liquid formed under ground from the decay of plants and animals over millions of years through extreme heat and pressure. Occasionally, this decaying material becomes trapped under a layer of impermeable rock that prevents it from dispersing and creates a pocket of oil. Similar processes also produce natural gas, which can be found mixed with oil or in separate deposits. Finding and extracting the oil and gas in these pockets is the primary function of this industry segment.

2. Metal ore mining industry segment covers the extraction of metal ores, primarily gold, silver, iron, copper, lead, and zinc. These naturally occurring minerals have a variety of industrial purposes: gold and silver are primarily used in jewelry and high-end electronics; iron is used to produce steel; copper is the main

3. Coal mining industry segment produces coal, a fossil fuel that is used primarily for electric power generation and in the production of steel. Like oil, coal is formed over millions of years from plant and animal matter, but unlike oil, coal is a solid and miners must go into the earth to recover it. Many coal seams are located close to the surface which makes the extraction of this resource easier.

4. Nonmetallic mineral mining and quarrying industry segment covers a wide range of mineral extraction. The majority of the industry produces crushed stone, sand, and gravel for use in construction of roads and buildings. Other important minerals produced are clays, primarily for ceramics, water filtration, and cement component of electrical wiring; lead is used in batteries; and zinc is used to coat iron and steel to reduce corrosion and as an alloy in the making of bronze and brass. Most metals do not exist in concentrated form but rather in small traces in rock called "ore". Some ores are currently mined that contain only a fraction of a percent of metal. As a result, a massive amount of rock must be extracted from the ground in order to obtain a useable amount of metal. As a result of this, metal mines can be much larger than coal mines and operate in more extreme environments.

5. Support activities for mining. The activities of this industry are often the same as those of the other industry segments, but the work is done by contract companies that specialize in one aspect of resource extraction.

(*The above information was adapted from www.wikipedia.org)*

1. Study the following words:

dragline mining – бестранспортная система разработки с перевалкой вскрыши драглайном
core samples – образец, вырезанный из толщи бетона, грунта
shuttle car – самоходная вагонетка
mechanical engineer – инженер-механик
blaster – взрыватель, дробеструйный аппарат
dragline operator – оператор драглайна (канатный скребковый экскаватор)
rock-dust machine – машина для осланцевания
engineering technician – инженер-техник
longwall mining – выборка руды длинными слоями параллельно этажным штрекам, выемка длинными забоями
dredge operator – оператор драг
crane – подъёмный кран
safety inspector – инспектор по технике безопасности
load-haul-dump machine – погрузочно-разгрузочная машина

surface mining – добыча открытым способом, открытая отработка, открытые горные работы
roof bolter – универсальная машина для бурения скважин под штанговую крепь и для закрепления в них штанг, анкероустановщик
rock splitter – электрогидравлический бур
underground mining – подземная выемка
longwall machine – длиннозабойная врубовая машина
dredge – дноуглубительный снаряд, землечерпалка; худшая часть руды (отделяемая отбойкой или отборкой)
brattice – перегородка
quarry – карьер, каменоломня
continuous mining – комбайновая выемка
explosives – взрывчатые вещества

2. Find the English equivalents to the following words:

бестранспортная система разработки с перевалкой вскрыши драглайном	оператор погрузочной машины	скребковый экскаватор
оператор машины для постановки анкерной крепи	самоходная вагонетка	горный инженер
техник бульдозер	(грузо-) подъемный Кран	
керн инженер – механик р	грузовик	
подземные горные работы	разработка длинными забоями	инспектор по технике безопасности
взрывник	заборная машина	
загрузка обкатка разгрузка	непрерывная выемка а	разработка открытым способом

3. Read the description of different jobs in mining industry and match each one with the corresponding job.

JOB	DEFINITION
1. roof bolter	a. split rough dimension stone into smaller units, such as paving blocks, ashlars, or rubble
2. brattice builder	b. place explosives in holes or other spots and detonate the explosives to demolish structures or to loosen, remove, or displace earth, rock, or other materials. Include tier-detonator blasters, perforator operators, and seismograph shooters.
3. dragline operator	c. perform engineering duties in planning and designing tools, engines, machines, and other mechanically functioning equipment. Oversee installation, operation, maintenance, and repair of such equipment as centralized heat, gas, water, and steam systems
4. dredge operator	d. study composition, structure, and history of the earth's crust; examine rocks, minerals, and fossil remains to identify and determine the sequence of processes affecting the development of the earth; apply knowledge of chemistry, physics, biology, and mathematics to explain these phenomena and to help locate mineral and petroleum deposits and underground water resources; prepare geologic reports and maps; and interpret research data to recommend further action for study.
5. loading machine operator	e. determine the location and plan the extraction of coal, metallic ores, nonmetallic minerals, and building materials, such as stone and gravel. Work involves conducting preliminary surveys of deposits or undeveloped mines and planning their development; examining deposits or mines to determine whether they can be worked at a profit; making geological and topographical surveys; evolving methods of mining best suited to character, type, and size of deposits; and supervising mining operations.
6. blaster	f. build doors or brattices (ventilation walls or partitions) in underground passageways to control the proper circulation of air through the passageways and to the working places.

JOB	DEFINITION
7. mechanical engineer	g. operate power-driven crane equipment with dragline bucket to excavate or move sand, gravel, mud, or other materials.
3. dragline operator	c. perform engineering duties in planning and designing tools, engines, machines, and other mechanically functioning equipment. Oversee installation, operation, maintenance, and repair of such equipment as centralized heat, gas, water, and steam systems
8. geologist	h. operate power-driven dredges to mine sand, gravel, or other materials from lakes, rivers, or streams; and to excavate and maintain navigable channels in waterways
9. mining engineer	i. operate underground loading machines to load coal, ore, or rock into shuttle or mine cars or onto conveyors. Loading equipment may include power shovels, hoisting engines equipped with cable- drawn scraper or scoop, or machines equipped with gathering arms and conveyor.
10. rock splitter	j. operate machinery to install roof support bolts in underground mine

4. Match the industry segments 1 – 5 with their functions a – e.

1. coal mining segment	a. produces petroleum and natural gas for commodity application
2. nonmetallic mineral mining and quarrying	b. contract companies specialize in one aspect of resource extraction
3. support activities	c. extraction of metal ores for a variety of industrial purposes
4. oil and gas extraction	d. a wide range of mineral extraction for different construction and domestic application
5. metal ore mining	e. produces coal for electrical power generation and production of steel

UNIT 4

Read the text

Mining industry (2)

Mining activities take place all over the world, and are often a major source of a country's natural wealth. Mining is the extraction of valuable minerals or other geological materials from the earth, usually from an ore body, vein or (coal) seam. Materials recovered by mining include base metals, precious metals, iron, uranium, coal, diamonds, limestone, oil shale, rock salt and potash. Any material that cannot be grown through agricultural processes, or created artificially in a laboratory or factory, is usually mined. Mining in a wider sense comprises extraction of any non-renewable resource (e.g., petroleum, natural gas, or even water).

The activities of the mining industry begin with exploration. Mining industry commonly includes such functions as exploration, mineral separation, hydrometallurgy, electrolytic reduction, and smelting and refining. After suitable deposits have been found and their worth proved, development, or preparation for mining is necessary.

Mining companies must periodically find new deposits. A unique feature of mining is the circumstance that mineral deposits undergoing extraction are “wasting assets,” meaning that they are not renewable as are other natural resources. Depletion means that the supplies of any particular mineral must be drawn from ever-lower-grade sources.

There are many types of mining operations. They range from precious metals, such as gold to other metals, and to minerals such as asbestos, sand, granite, and iron ore. Nonmetal mining can take many forms, including coal mining, which supplies much of the world's energy, and the mining of other materials such as clay, diamonds, semiprecious stones, and related substances.

Types of mining:

Placer mining involves any type of mining where raw minerals are deposited in sand or gravel or on the surface and are picked up without having to drive, use dynamite or any other significant means. The word placer means "sand bank" in Spanish. Specific types of placer mining are panning, dredging, sluicing, using a Rocker, or just picking up what lies on the ground.

Hydraulic mining involves high pressure water. The water is sprayed at an area of rock and/or gravel and the water breaks the rock up, dislodging ore and placer deposits. The water / ore mixture is then milled. This is a very destructive way to mine and has been outlawed in most areas.

Hardrock mining is digging into solid rock to fine minerals usually in their ore form (the metal plus oxygen). To do this, miners used picks and shovels, rock drills, dynamite and more. Miners dug either shafts that went straight down to follow ore bodies and veins, or tunnels which went somewhat horizontal into rock faces. Shafts usually had some sort of head frame (pictured left) standing above them to support the hoists. Shafts and tunnels were often supported with large timbers to prevent cave-ins.

(The above information was adapted from http://www.Wikipedia)

1. Work in pairs. Without looking at the text again, see how much you can remember.

1. What is the first activity in mining?
2. How many types of mining operations are there?
3. Why do mining companies periodically find new deposits?

2. Study the following words:

adit level – горизонт штольни
adit portal – устье штольни
breather tubes – вентиляционная труба
broken ore – отбитая руда
cable bolt – тросовый анкер
depletion – истощение
grout hose – шланг для инъецирования (нагнетания) растворной смеси
haulage drift – откаточная выработка; откаточный штрек
incline shaft – наклонный ствол
loading station – погрузочная станция
mineral separation – обогащение минерального сырья

non-metal mining – добыча неметаллических руд
ore bin – рудный бункер
placer – россыпь
shaft pillar – опора вала
smelting – плавление
tape – лента
unbroken ore – цельная руда
unmined ore – необработанная руда
vertical shaft – вертикальная шахта
waste dump – породный отвал (карьера), свалка отходов
wasting asset – активы типа месторождений минеральных ископаемых, рудников, лесов, которые со временем истощаются и ликвидируются
winze – подземная выработка, слепой ствол
reduction – процесс отделения металла от руд, сужение поперечного сечения, удаление кислорода

3. Tell in what branch of geology you would like to work in and why.

UNIT 5

Read the text

A Brief History of Mining: The Advancement of Mining Techniques and Technology

Since civilization began, people have used mining techniques to access minerals in the surface of the Earth. Discoveries have shown that flint pebbles were extracted from deposits in France and Britain as far back as the New Stone Age. Ancient Egyptians mined copper as far back as 3000 BCE. In the earliest days, mining was slow-going and dangerous. However, as time progressed, society has developed safer and more accurate methods of locating and uncovering substances found in the earth.

United States Mining History

In 1848, the California Gold Rush brought approximately 300,000 people to California from abroad and elsewhere in the country.

In 1858, people flocked to Colorado during the Pike's Peak Gold Rush. Just one year later, silver veins were discovered in Colorado as well.

From 1898 to 1911, the Nome Gold Rush, Klondike Gold Rush, and Fairbanks Gold Rush occurred in Alaska, bringing prospectors and miners to the Yukon River Valley.

Coal mining

Some coal mining began before 1900, but the most productive coal mining techniques didn't develop until after the turn of the century, including the first conveyor belt and mechanized coal loading. Bituminous coal overtook anthracite in the mid-1800s. In the 1960s, smaller coal companies merged into larger, more diversified firms. In 2008, competition in the coal mining industry became more intense than ever, leading to a demand for better technology and new mines.

History of Mining Technology

In the beginning, miners used primitive tools for digging. Mining shafts were dug out by hand or using stone tools, making the entire process very lengthy. Eventually, the pick and hammer were replaced with fire to clear tunnels and reach greater depths at a faster rate. By piling a heap of logs near the rock face and burning them, the rock weakened and fractured.

Mining technology leaped forward again in the late Middle Ages when miners started using explosives to break up large rocks. Black powder reached the West, likely from China. Black powder was eventually replaced with dynamite in the mid-19th century. At the same time, advancements were being made in motorized mining tools, such as drills, lifts and steam-powered pumps.

The Industrial Revolution spurred improvements in explosives and mining equipment. Mechanical drills powered by pistons, then compressed air, significantly increased the capability and efficiency of mining hard rock. Improvements in other mining processes occurred too. Hand-powered loading and hauling were replaced by electric conveyors, mine cars, and vehicles. Steam-driven pumps solved the problem of water inflow. Candles and oil-wick lamps were improved by gas lamps, and eventually battery-powered lamps. Mechanization and new technology sparked dramatic improvements in mining techniques.

Mining Technology in the Present

In today's technologically-advanced society, mining techniques are always improving. For example, using surface mining techniques, many mining operations are now able to extract over 85 percent of minerals and 98 percent of metallic ores – without digging a shaft or endangering the lives of workers. Newly-developed machines used for grinding and crushing can extract minerals from the earth with less energy than ever before.

Miners still use heavy machinery, such as explosives, trucks, drills, and bulldozers, especially if they must dig deep into the earth. However, advances in technology have allowed miners to excavate with more accuracy and less harm to the surrounding environment. More efficient machinery can also be used to reduce energy consumption and improve the number of minerals or metals gleaned from the shaft.

The history of mining is rich and complicated. Mining has led to great advancements for society, but the dangers of mining have also resulted in the deaths of many workers. As technology continues to advance, however, mining techniques become even more accurate and efficient. In the future, revolutionary technologies may eliminate the need for hands-on involvement from miners entirely.

(The above information was adapted from http://www.Wikipedia)

Study the following words:

flint pebbles – кремневая галька
vein – жила
prospector – старатель
conveyor belt – лента транспортёра, конвейерная лента
bituminous coal – смолистый уголь
anthracite – ископаемый уголь наиболее высокой степени углефикации (метаморфизма)
motorized mining tools – механизированные инструменты добычи полезных ископаемых
steam-powered pumps – паровые насосы
grinding – дробление
glean – добывать
hands-on – практический

1. Make presentations on the historical stages in the development of the mining industry

2. Translate from Russian to English:

1. Горное дело – это промышленность, которая обеспечивает человечество металлами, минералами, драгоценностями, и другим сырьем. Ее развитие началось еще с древних времен.

2. Шахты, карьеры, разрезы, скважины, бассейны – на всех местах добычи полезных ископаемых задействовано огромное количество техники. Но 1000 лет назад вся эта работа велась голыми руками, у человечества не было врубовых комбайнов, экскаваторов, конвейеров, самосвалов и прочих машин.

3. Невозможно предположить, какой вклад горная промышленность вложила в развитие человечества. Ее продукты являются сырьем для большинства предметов, которые мы используем каждый день.

4. С развитием труда, эволюцией человека, началось добыча горной руды, неметаллических полезных ископаемых, минеральных и топливных ресурсов. Люди замечали, что некоторые камни намного крепче других, выбирая их по характерному внешнему виду, они отдавали предпочтение именно этому сырью.

5. С появлением металла жизнь человека начала стремительно развиваться. Этот пластичный и многофункциональный материал является одним из продуктов горнодобывающей промышленности.

6. В конце каменного века был найден и уголь, камень, который долго горел, и производил много тепла.

7. Добыча камня была очень хорошо развита в Египте. Ученые до сих пор ломают голову, каким образом им удавалось передвигать огромные блоки и обрабатывать их с такой идеальной точностью.

UNIT 6

Read the text

Methods of Mining

When a mineral deposit is found, it is studied to determine if it can be mined profitably. If so, the deposit can be worked or extracted by a variety of mining methods.

Underground mining includes drift, slope, and shaft mining, and actual mining methods include longwall and room and pillar mining. Drift mines enter horizontally into the side of a hill and mine the coal within the hill. Slope mines usually begin in a valley bottom, and a tunnel slopes down to the coal to be mined. Shaft mines are the deepest mines.

In room and pillar mining (the most common type of underground coal mining) coal seams are mined as a network of "rooms". "Pillars" composed of coal are left behind to support the roof of the mine. Each "room" alternates with a "pillar" of greater width for support. Using this mining method normally results in a reduction in recovery of as much as 60 percent because of coal being left in the ground as pillars.

Longwall mining is another type of underground mining. Mechanized shearers are used to cut and remove the coal at the face of the mine. This method of mining has proven to be more efficient than room and pillar mining, with a recovery rate of nearly 75 percent, but the equipment is more expensive than conventional equipment, and cannot be used in all geological circumstances.

Surface-mining methods include area, contour, mountaintop removal, and auger mining. Area mines are surface mines that remove shallow coal over a broad area where the land is fairly flat.

Contour mines are surface mines that mine coal in steep, hilly, or mountainous terrain. Mountaintop removal mines are special area mines used where several thick coal seams occur near the top of a mountain. Large quantities of overburden are removed from the top of the mountains, and this material is used to fill in valleys next to the mine. Augur mines are operated on surface-mine benches.

Dredging is a high-volume mining technique for low-value products near a plentiful source of water. Scoops/buckets are used to extract material from shallow water. Dredging is an excavation activity or operation usually carried out at least partly underwater, in shallow seas or fresh water areas with the purpose of gathering up bottom sediments and disposing of them at a different location. Grab dredgers are a relatively simple method of dredging which involves the collection of sediments in a crane mounted bucket, the jaws of which are opened and closed (rope operated or hydraulically) like a clamshell trapping sediments. The mining process is usually combined with the processing (typically drying and concentration) on a floating barge, which is anchored in the middle of the lagoon.

(The above information was adapted from http://www.Wikipedia)

1. Scan the text quickly to find out which method is used to mine the following minerals \ metals.

a. minerals \ rocks found near the surface (sand, cinder, gravel)
b. coal
c. gold, copper, zinc, nickel, lead
d. underwater mineral deposits

2. Study the following words:

underground mining – подземная добыча, подземная выемка
drift, slope, and shaft mining – разработка штреков, склонов и шахт
room and pillar mining – камерно-столбовая разработка
coal seams – угольный пласт
longwall mining / longwall minings – сплошная выемка, добыча в длинных забоях.
mechanized shearers – резательные машины, механизированные ножницы
the face of the mine – забой
Surface mining – добыча открытым способом, открытая отработка, открытые горные работы, разработка открытым способом
contour – профиль, очертания, структурная карта
auger mining – разработка угля с применением шнековых буров
overburden – перекрывающие породы; покровные отложения, перекрывающие россыпь
dredging – вычерпывание

scoops/buckets – совки, ведра
sediment – осадок
grab dredgers – грейферный земснаряд
clamshell – грейфер
floating barge – баржа для морского бурения

3. Retell the text

UNIT 7

Read the text

Geological Exploration - Rocks and Rock Structure

To find a particular ore, one must begin by looking in regions where the ore is formed and/or concentrated. Therefore, before exploration one must have an understanding of the geologic forces that form rocks and ore deposits.

A rock is a mineral, or aggregate of minerals, that forms an essential part of the earth's crust. In other words, enough of a particular mixture of minerals exists, so that the rock can be named and recognized in many localities throughout the world. Rocks differ from minerals in that rocks are merely physical mixtures of minerals, while the minerals themselves are chemical compounds of fairly uniform composition. Rock structures can be indicative of ore deposits, as well as, the potential size of an ore deposit.

Any rock can be classified as one of three types: **igneous**, **sedimentary**, or **metamorphic**. This method of classification is based on the mode of formation of the rock. Igneous rock is formed from a molten state. The sedimentary rocks are formed from sediments or erosion fragments deposited in lake and ocean beds. Metamorphic rocks form when great heat and pressure, caused by deep burial, alter the physical condition of sedimentary, igneous, or another metamorphic rock.

Igneous (fire formed) rocks are formed in deep-seated areas of the earth's crust. They may be fine grained, large grained or a combination of large and small grains. The grain size indicates the cooling rate of the rock. Fine grained (dense) igneous rocks form when rapid cooling occurs. Conversely, coarse-grained rocks cooled slowly and crystals grew large. Fundamentally, igneous rocks are classified as either intrusive or extrusive. Intrusive rocks originate from magmas (molten rock materials combined with gases) at depth in the earth. Intrusive rocks occur as massive structure or as in "injection" structure. This latter structure forms when the hot, liquid or plastic rock is injected into fractures in the surrounding solid rock. Intrusive action leads to the formation of **batholiths**, **laccoliths**, **stocks**, **dikes**, and **sills**. Weathering and erosion later expose these structures on the earth's surface. Extrusive rocks are formed by volcanic activity at the surface of the earth. These rocks cool rapidly. Examples of some common igneous rocks are: rhyolite, andesite, basalt, granite, diorite, gabbro.

The formation of sedimentary rocks begins with the breaking down of other rocks into fragments. The forces of weathering and erosion, such as running water or freezing and thawing, accomplish this mechanical and chemical breakdown. Fragments are transported to and deposited in lake and ocean bottoms. Later, spaces between the fragments are filled with a cementing material or are eliminated by pressure. After some time passes, a massive rock layer results. Sedimentary rocks are classified based on the size of the particle of the sediment, or fragment. Shale (dense, fine particles), sandstone (particles distinguishable to the naked eye) and conglomerate (pebbles and gravel cemented together) are examples of sedimentary rocks.

Metamorphic rocks are formed from previously existing igneous, sedimentary or possibly other metamorphic rocks. Great heat and pressure, yet not enough to completely melt the rock, alter the rocks original physical composition. Sometimes the process of metamorphism aligns the grains in parallel layers or bands. This layering is called foliation. When broken, a metamorphic rock usually breaks along the plane of foliation. Metamorphic rocks are classified based on their grain size and degree of foliation. Some examples of metamorphic rocks are: slate, schist, gneiss.

(The above information was adapted from Leo Mark Anthony and Michael Mark Anthony, Introductory Prospecting and Mining, pp. 69-93. Mining and Petroleum Training Service, (University of Alaska, Soldotna, AK, 1997.)

Read the text again to find the answers to these questions.

1. What is a rock?
2. How are rocks named?
3. What are minerals?
4. How many types of rocks are there?
5. The rock classification is based on what feature?
6. How does the cooling rate influence the grain size in igneous rocks?
7. Where do intrusive rocks form?
8. How are extrusive rocks formed?
9. What common igneous rocks can you name?
10. What is mechanical and chemical breakdown?
11. What affects the classification of sedimentary rocks?
12. What is foliation?
13. How are metamorphic rocks classified?
14. Is heat and pressure enough to form metamorphic rocks?

1. Study the following words:

aggregate – совокупность
earth's crust – земная кора
compounds – компонент, составляющая
igneous – магматический
sedimentary – осадочный
metamorphic – метаморфический
ocean bed – морское дно
deep-seated areas – глубоко залегающий
grain – частица
intrusive – интрузивный, плутонический
extrusive – экструзивный
fracture – трещина, разлом
batholiths – батолиты
laccoliths – лакколиты
stocks – шток (в геологии: интрузивное тело, в вертикальном разрезе имеющее форму колонны)
dikes – дайка (интрузивное тело, пластинообразное, вертикально стоящее (или близкое к вертикали) геол. тело, ограниченное параллельными стенками и секущее вмещающие породы)

sills – силл (пластообразное интрузивное тело, залегающее согласно с напластованием вмещающих осадочных или вулканич. пород)
weathering – выветривание
rhyolite – риолит
gabbro – габбро
shale – сланец
align – визировать, ставить на одну линию
foliation – слоение
schist – (кристаллический) сланец
gneiss – гнейс
slate – шифер

2. Prepare mini reports on what minerals can be found in Kyrgyzstan

3. Translate sentences from Russian to English:

1. Структура горных пород определяется размером, формой и характером срастания минералов, а также степенью кристалличности вещества.
2. По происхождению горные породы делятся на три основные группы: *магматические, осадочные и метаморфические.*
3. Магматические и метаморфические горные породы составляют 95% всей массы пород, слагающих земную кору, на осадочные породы приходится 5%.
4. Магматические горные породы образуются в результате застывания и затвердевания магмы, как на глубине, так и на поверхности земной коры после её излияния. В зависимости от этого они делятся на глубинные – интрузивные и излившиеся – эффузивные.
5. Осадочные горные породы образуются на поверхности земной коры из продуктов разрушения ранее образованных горных пород, а также химических и органогенных осадков. Проницаемые и пористые разности осадочных горных пород являются коллекторами для нефти и газа и могут их содержать.

UNIT 8

Read the text

Structural Control of Ore Deposits

The formation of valuable mineral deposits results from a combination of factors, conditions, and events which go hand in hand to determine the areas in which metals are gathered into concentrations greatly. **Differentiation** of large masses of rock material in a molten state is a major means of metal accumulation. Highly mobile and volatile solutions contain high concentrations of metal and carry them to some point where chemical and physical conditions are favorable for deposition. Hydrothermal and secondary deposits are found in areas where rocks have been "prepared" in advance by some kind of structural deformation. Areas of mountain building activity combine structural deformation and igneous activity. They are favorable places for ore deposits.

There are two divisions of rock structures, which control ore formation, primary structures, and secondary structures:

Primary structures are features such as bedding in sediments, igneous contacts, pillows in lavas, and other minor features that developed during the formation of the rock mass. Such structures might have had important local influence on the size, shape, or grade of a deposit. Bedding surfaces, igneous contact, or intergranular spaces might act as zones along which solutions move to points of deposition;

Secondary structures develop after the formation of the rock. They are such features as faults (fractures in rock masses with major slippage), joints (cracks in which there has been no movement of the rock on side of the opening relative to the other side), and folds, and are of greater importance in control of ore deposition than are the primary structures.

(The above information was adapted from Leo Mark Anthony and Michael Mark Anthony, Introductory Prospecting and Mining, pp. 69-93. Mining and Petroleum Training Service, University of Alaska, Soldotna, AK, 1997.)

1. Answer the following questions which will help you to write your summary.

1. What is the main idea of this text?
2. How many parts can you divide the text into?
3. Can each part be an independent text? Why?

2. Study the following words:

differentiation – дифференциация, происходящая при восходящем движении магмы
volatile – неустойчивый, непостоянный, нестабильный, волатильный
deposition – отложение, осадконакопление
bedding – залегание
intergranular – междугранулярный, интеркристаллитный

3. Translate sentences from Russian to English:

1. Первичные формы залегания образуются одновременно с формированием пород. Для осадочных пород это – слои и слоистые толщи, для магматических – глубинные массивы или потоки и покровы, для метаморфических – полосчатые толщи или массивы.

2. Вторичные или нарушенные формы залегания возникают уже после образования пород в результате складчато-разрывных движений.

3. Важным фактором эволюции и дифференциации магматических расплавов является их взаимодействие с вмещающими породами.

4. Условия залегания горных пород характеризуются несколькими признаками – формой залегания геологических тел, элементами залегания поверхностей напластования, плоскостями контактов, структурными элементами складок, тектоническими нарушениями и их элементами.

5. Характер залегания секущих интрузий зависит от расположения той полости или трещины, в которую внедрялся магматический расплав. Форма залегания слоистых осадочных, вулканогенных и метаморфических образований может быть

первичной (ненарушенной) и вторичной (нарушенной), горизонтальной, наклонной или складчатой.

6. Горизонтальное положение образований может наблюдаться при нормальном залегании, при опрокинутом и в пакетах изоклинальных складок с горизонтальными осевыми поверхностями.

4. Write an annotation to the text

UNIT 9

Read the text

Mining equipment

The scraper is most widely used in mines both for underground and open-pit operations for loading cars and transporting ore or waste for a short distance. There are two main types of scrapers – the open and the box type. The capacity of scrapers varies with the type of scraper used, the physical characteristics of the material handled, and the average rope speed.

For open-pit mining power shovels are widely used. Under normal conditions about 25 power shovels may be employed in a pit, having a bucket capacity of 4 to 8 cu. in. and loading into 50-ton mine cars or into trucks when trackless mining is used.

Apart from the above, every day sees the introduction of new mining equipment for some special use or for combined operations underground, and at the present time but little work is done by hand.

In coal mining longwall cutters are used which make a horizontal cut in the solid coal to a depth determined by conditions, in order to assist in breaking down the coal by subsequent use of explosives or other means. The cut can be made at any level between the roof and floor of the seam, but is generally made at floor level by an under cutter. The cut is made by specially shaped picks fitted to an endless chain running at a speed of between 350 to 500 ft./min and the cutter is hauled along the floor by a wire rope coiled around a suitable drum.

There are many types of cutters available designed to fit specified conditions. A new mining machine which does all laborconsuming operations in development of drifts for manganese mining has been built at Dnepropetrovsk Mining Institute, in the Ukraine. The machine is designed for heavy duty in the mines of Nikopol manganese ore basin. It will break up rock, load it into trolleys, and at the same time put up concrete props. In one month this machine prepares 600 meters of drift.

Loading in all the major working in metal mines is usually done by means of mechanical rail-mounted overhead loaders or crawler mounted loaders in trackless mines. They are fitted with a 1/2-cu. yd. bucket which swings completely over for discharge into the mine cars. This machine is fit for headroom between 7 ft. 6 in. to 8 ft. 6 in., discharge heights varying from 4 ft. to 6 ft. The entire unit weighs just over 3 1/2 tons and is powered by three reversible compressed-air motors, which have an average overall consumption of approximately 240 cu. ft. per minute at 90 lb. per sq. in. (psi).

A novel type of a mucking machine and a truck all-in-one is announced by an American company. This Transloader is a high-speed trackless transport: it can move up to 20 miles per hour either direction with round trip 1,600 ft. On shorter hauls the tonnage ranges up to 2 tons a minute. On longer hauls tonnages range down to 1 ton a minute. The Transloader is operated by only one man, mucking and hauling in the development and production work. Neither the Transloader nor its operator are ever idle.

(The above information was adapted from http://www.Wikipedia)

1. Study the following words:

power shovel – механическая лопата, экскаватор;
trackless mining – ведение горных работ с безрельсовым транспортом;
longwall undercutter – длиннозабойная врубовая машина;
rail-mounted overhead loader – разгружающая через себя погрузочная машина на рельсовом ходу;
crawlermounted loader – погрузочная машина на гусеничном ходу;
mucking machine – машина, убирающая руду или породу (из забоя), разгружающая руду или породу в вагонетки.
transloader – перегрузчик, транспортно-перегрузочный агрегат

2. Ask five different types of questions to the text and answer them.

3. Translate sentences from Russian to English

1. Современная горнодобывающая промышленность по методу добычи полезных ископаемых разделена на два основных направления: открытый способ добычи, когда материалы добываются в карьере, и подземный, с сооружением шахт.
2. Так же делится и техника, применяемая в горном деле – для каждого вида работ используются свои, часто очень специфические машины.
3. На первом месте стоят вскрышные экскаваторы, применяемые для выемки пород и полезных ископаемых на открытых горных разработках. Наиболее крупные из них – драглайны, или шагающие экскаваторы.
4. Гидравлический экскаватор все чаще можно увидеть в карьере, один за другим горнодобытчики отказываются от устаревших тросовых экскаваторов, так называемых «механических лопат» – до недавнего времени наиболее распространенного вида выемочно-погрузочных машин на открытых разработках всего мира.
5. Для работы в паре с экскаваторами и для перевозки добытой породы в карьере не обойтись без специальных карьерных самосвалов.
6. Для погрузки и перевозки разрыхленных горных пород в карьерах нашлось место и фронтальным погрузчикам. Они применяются в горнодобыче с 1970-х гг. как на вскрышных работах, так и в качестве дополнительного погрузочного и вспомогательного оборудования.

4. Prepare mini presentations on the equipment innovations in the mining sector.

UNIT 10

Read the text

Mining geodesy

Mining geodesy is a branch of mining dealing with the dimensional-geometric measuring of mines and open-pits and the ways of solving mining-geometrical problems.

Mining geodesy has for its object obtaining data as to the form of mineral deposits, determining the size and position of mine workings as well as laying out mining. Vertical and horizontal surveys are known to be run with the help of theodolite and levelling traverse, measuring angles, elevations and distances up to the sighted object. For this purpose the following instruments are employed: transit, levels, rods, depth measurers, protractors, tacheometer-telemeters, self-recording devices, photo-theodolites and others.

Levels. Precise levels belong in their essentials either to the *Y* or *dumpy type.* In both the telescope is mounted on a vertical axis about which it can swing horizontally and is levelled by levelling screws. The distinguishing feature of the Y-level over the dumply level is the possibility of its telescope being reversed in the Y-supports.

The Zeiss level is known to be the most widely used dumpy level. As compared with other dumpy levels used for ordinary levelling the most distinctive features of the Zeiss level are the methods of mounting the telescope and level tube, the design of the telescope and the arrangement for showing the observer if the bubble is central while he is sighting. *The level tube* is fixed on one side of the telescope. *The metal tube* carrying it is cut away both on top and bottom. *The bubble* is illuminated by means of the reflector. The telescope with the level tube is capable of rotation through 180° about its own axis, so that the level can lie either on the left- or right-hand side. The level tube is not graduated but the observer can tell when the bubble is central by means of a combination of prisms contained within *the casing*.

In addition to the means for reversal of the telescope about its own axis, *the telescope fittings* are such that the ends can be reversed, the eyepiece being inserted in the objective cap. Observations can therefore be taken in four positions: 1 and 2 eyepiece direct, bubble tube on left (right) of telescope; 3 and 4 eyepiece reversed, bubble tube on left (right) of telescope. The prism is reversed for position 3 and 4.

Levelling rods. Levelling rods are of two types: *target* and *self levelling;* the former is read by a rodman, the latter by a levelman. The rods are usually made of strips. The graduations (meters and decimeters) are painted on the wood. The figures indicating the heights are inverted for ease in reading with an inverting telescope. Sometimes for more accurate work the centimeters are painted on a strip of invar which is fastened securely to a metal foot piece which lies against the face of the rod held by flat-headed screws.

Verticality of the rod is determined by means of a circular spirit level or two levels attached at the back. A similar scale of feet (or meters) is often painted on the back of the rod for checking the readings.

(The above information was adapted from http://www.Wikipedia)

1. Study the following words:

levelling traverse – нивелирный ход;
transit – теодолит;
levelling rod – нивелирная рейка;
protractor – угломер, транспортир;
Y-level – нивелир с перекладной зрительной трубой;
Y-supports – лагеры (опорные развилки для трубы нивелира);
dumpy level – глухой нивелир (с закрепленной трубой);
level tube – цилиндрический уровень;
casing – футляр, коробка, корпус, обсадная труба;
self levelling rod – простая рейка, рейка без движка;
invar – инварный, из железоникелевого сплава.

2. Ask five different types of questions to the text and answer them.

3. Translate sentences from Russian to English

1. Маркше́йдер (нем. Markscheider маркшайдер; от Mark «отметка», «граница» + Scheider «отделитель») – горный инженер или техник, специалист по проведению пространственно-геометрических измерений в недрах земли и на

соответствующих участках её поверхности с последующим отображением результатов измерений на планах, картах и разрезах при горных и геологоразведочных работах.

2. Маркшейдерское дело – отрасль горной науки и техники, предметом которой является изучение на основе натурных измерений и последующих геометрических построений структуры месторождения, формы и размеров тел полезного ископаемого в недрах, размещения в них полезных и вредных компонентов, свойств вмещающих пород, пространственного расположения выработок, процессов деформации пород и земной поверхности в связи с горными работами, а также отражение динамики производственного процесса горного предприятия. Работы выполняются с помощью маркшейдерских приборов. Данные синтезируются в горной графической документации, представляющей собой чертежи, полученные методом геометрической проекции.
3. На маркшейдере лежит ответственность за соблюдение всех проектных параметров систем разработки полезного ископаемого, всех параметров и деформаций зданий и сооружений в шахте и на поверхности горного предприятия. Помимо определённых знаний, умений и навыков, он обязан обладать очень уравновешенным характером, быть бесконечно педантичным, аккуратным и точным в исполнении своих обязанностей, знать технику безопасности. Ошибки в его работе могут привести к колоссальным убыткам, авариям с массовой гибелью людей. Маркшейдер занимается учётом движения и состоянием запасов полезного ископаемого (вскрытые, подготовленные и готовые к выемке запасы), учётом потерь и разубоживания полезного ископаемого.
4. Маркшейдерская служба на горном предприятии также следит за процессом сдвижения горных пород на бортах карьера, отвалах пустых пород, и при необходимости предпринимает меры для предотвращения сдвижения горных пород, либо о предотвращении дальнейших горных работ. Смежная профессия в наземном строительстве – инженер-геодезист.

4. Retell the text

Тексты для дополнительного чтения

Text 1
A. P. Karpinsky (1847–1936)

V. A. Obruchev, I. M. Gubkin, A. Y. Fersman, V. I. Vernadsky and A. P. Karpinsky were the prominent Russian scientists who laid the foundation of the Russian school of geology and mining. An entire epoch in the history of Russian geology is connected with Karpinsky's name.

One of the greatest Russian geologists, he was a member and for some time President of the Academy of Sciences of the former USSR and a member of several Academies abroad. The Geological Society of London elected him a foreign member in 1901. His greatest contribution to geology was a new detailed geological map of the European part of Russia and the Urals. For many years, he headed the Russian Geological Committee the staff of which was made up of his pupils. He was one of those geologists who embraced the whole of geological science. He created the new stratigraphy of Russia. He studied the geological systems in various regions of the country and was the first to establish the regularity of the Earth's crust movement. His paleontological studies are of no less importance, especially those on Paleozoic ammonoids. He also took an interest in deposits of useful minerals and gave a classification of volcanic rocks. He advanced the view that petroleum deposits existed in Russia, which was confirmed later. He studied some ore and platinum deposits and may be justly considered the founder of practical geology of the Urals.

He was the first Russian scientist who introduced microscope in the study of petrography slides. Karpinsky was a prominent scientist, an excellent man and citizen. He was one of the best lecturers at the Mining Institute in his time. He was also one of the greatest Russian scientists who later became the first elected President of the Academy of Sciences of the USSR. Students were attracted to him not only because he was a great scientist but also because of his charming personality and gentle manner. Every geologist and every geology student knows very well Karpinsky's most significant work An Outline of the Physical and Geographical Conditions in European Russia in Past Geological Periods.

Notes:

1. to lay the foundation – заложить фундамент (основы)
2. to be made up of – состоять из
3. was the first to establish – первым установил
4. to take an interest in – интересоваться
5. may be considered – может считаться (сочетание модального глагола с пассивной формой инфинитива)

Text 2
Minerals

A detailed study of the earth's crust begins with the minerals.

The majority of the materials known to man are in a crystalline state and only a small number is in an amorphous state. The difference between the crystalline and amorphous state is that when elements are in a crystalline state the molecules, atoms or ions of each are arranged in a definite order and form a spatial lattice, while in the latter state there is no regular arrangement of particles. The difference in the internal structure of crystalline and amorphous bodies accounts for the difference in their physical properties.

When minerals solidify and grow they usually form symmetrical shapes known as crystals. The planes that form the outside of the crystals are known as faces. Every crystal forms one of six groups of shapes called systems. Each crystal system is different because the arrangement of atoms and ions within the crystal is different. Thus, the sodium and chlorine ions in halite form cubes and therefore the mineral crystallizes in cubes.

Each crystal has one vertical axis and two or three horizontal axes, which extend through the center of the crystal. In each crystal system the length of the axes and the angle of intersection are different.

There are different methods for identifying minerals based on a study of their optical and chemical properties, chemical composition, and so on. Minerals can be identified through X-ray diffraction, spectrographic and thermal analyses. But when conducting geological exploration in the field a geologist should be able to identify the principal minerals with a naked eye. To do this the following physical properties are of great help: colour, luster, transparency, fracture, cleavage, hardness, and specific gravity. These properties are closely associated with the internal structure of minerals, with the texture of their crystalline lattice.

(https://en.wikipedia.org/wiki/Mining_engineering)

Text 3
Drilling Technologies

Almost all mineral exploration involves drilling to discover what is below the surface. No significant changes in mineral drilling technology or techniques have been made for more than three decades (NRC, 1994b). This contrasts sharply with spectacular advances in drilling technologies, including highly directional drilling, horizontal drilling, and a wide range of drilling tools for the in-situ measurement of rock properties, for the petroleum and geothermal sectors. Mineral exploration involves both percussion and rotary drilling that produce rock chips and intact samples of core. The diameter of mineral exploration drill holes (called slimholes) is generally much smaller than the diameter of either petroleum or geothermal wells. Therefore, many of the down-hole tools used for drilling in the petroleum and geothermal fields are too large to be used in the mineral exploration slimholes. The need for miniaturization of existing drilling equipment is growing not only in the mineral industry but also for NASA to investigate drilling on Mars. The development of guided microdrill systems for the shallow depths of many mineral exploration projects will be challenging.

Drilling generally represents the largest single cost associated with mineral exploration and the delineation of an ore deposit once it has been discovered. Hundreds of drill holes may be required to define the boundaries and evaluate the quality of an orebody. Decreasing the number of drill holes, increasing the drilling rate, or reducing the energy requirements for drilling would have a substantial impact on mineral exploration and development costs. In many situations directional drilling could significantly reduce the number of drill holes required to discover a resource in the ground. Novel drilling technologies, such as down-hole hammers, turbodrills, in-hole drilling motors, and jet drilling systems, have the potential to increase the drilling rate. Novel technologies, together with more efficient rock bits, could also reduce energy requirements for drilling.

Down-hole logging is a standard technique in petroleum exploration. However, it is rarely used in mineral exploration. Standard petroleum well-logging techniques include gamma-ray surveys (to distinguish different rock types based on natural radioactivity), spontaneous potential (to determine the location of shales and zones with saline groundwater), mechanical caliper and dipmeter test (to determine dip and structure of the rock mass penetrated), and a variety of other geophysical tests (resistivity, induction, density, and neutron activation). These tests determine the physical properties of the drilled rock mass and differentiate rock types. Typically, the minerals industry has obtained some of this information by taking samples of rock (either drill chips or drill cores) for analysis. The development of down-hole analytical devices, such as spectrometers, would make it possible to conduct in-situ, real-time analyses of trace elements in the rock mass that could dramatically shorten the time required to determine if a drill hole had “hit” or not. Miniaturization will be necessary for existing down-hole technologies to be used in slimholes.

Drilling and access for drilling generally represent the most invasive aspect of mineral exploration. The environmental impacts of exploration activities could be significantly reduced by the development of drilling technologies that would minimize the footprint of these activities on the ground, such as the miniturization of drilling rigs, the ability to test larger areas from each drill site, and better initial targeting to minimize the number of holes.

(https://www.nap.edu/read/10318/chapter/5#28)

Text 4
Underground Mining

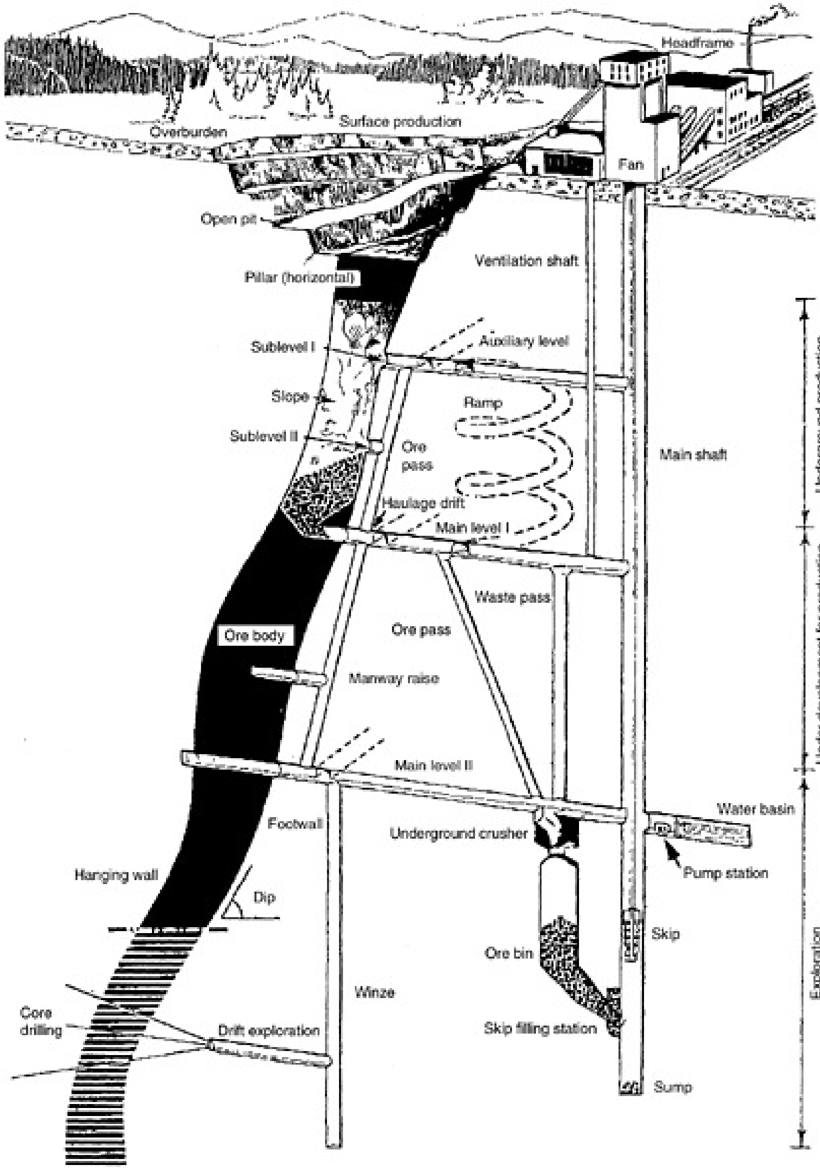
Underground mining is used when the deposit is too deep for surface mining or there is a restriction on the use of the surface land. The deposit is accessed from the surface by vertical shafts, horizontal adits, or inclines. The deposit itself is developed by criss-crossing openings (called levels, cross-cuts, raises, etc.) in the orebody, not only to create blocks of ore to be extracted according to a scheme but also to provide for human access, the transport of ore and waste, and adequate ventilation. The drilling, blasting, loading, and transporting of ore from active working areas (faces) are carried out according to a mining plan. If the deposit is soft, such as coal, potash, or salt, mechanical means can be used to cut and load the deposit, thereby eliminating the need for drilling and blasting. In hard-rock mines carefully planned drilling into the ore and blasting with dynamite or ammonium-nitrate explosives are common. Underground metal-mining methods may be unsupported, supported, and caving methods, and there are numerous variations of each. Open stopes, room-and-pillar, and sublevel stoping methods are the most common unsupported methods; cut-and-fill stoping when the fill is often waste from the mine and mill tailings is the most common method of supported underground mining. Because of the high costs associated with supported and unsupported mining methods, open stoping with caving methods is used whenever feasible.

Underground coal mining today is basically done by two methods: room-and-pillar mining with continuous miners, and longwall mining with shearers. The former is essential for developing large blocks of coal for longwall extraction.

The production and productivity of individual, continuous, and longwall production units have increased consistently over the years. In the last two decades longwall mining in the U.S. coal industry has increased from less than 10 percent to nearly 50 percent of the underground tonnage (Fiscor, 1999; NMA, 1999). Currently, about 60 longwall faces produce about 180 million tons of coal per year. However, the production rate depends on the width of the face, the thickness of the seam, and the system for removing the coal from the face.

In longwall mining, operations are concentrated along face from 250 meters to 350 meters wide. The height of extraction is usually the thickness of the coal seam. The length of the longwall block is about 3,000 meters to 5,000 meters. In a 3 meter thick coal seam the amount of coal in place in a block is six to seven million tons. The basic equipment is a shearer (a cutting machine) mounted on a steel conveyor that moves it along the face (Figure 3-7). The conveyor discharges the coal onto a conveyor belt for transport out of the mine. The longwall face crew, the shearer, and the face conveyor are under a continuous canopy of steel created by supports called shields. The shields, face conveyor, and shearer are connected to each other and move in a programmed sequence so that the longwall face is always supported as the shearer continuously cuts the coal in slices about 1 meter thick. The shearer is much like a cheese slicer running back and forth across a block of cheese. Modern longwalls are very capital intensive (the equipment alone costs more than $25 million), highly instrumented and automated, employ fewer than six workers at the face, and produce more than 10,000 tons per shift (more than 5 million tons per year).

(https://www.nap.edu/read/10318/chapter/5#28)


Headframe
Surface production
Overburden
Fan
Open pit
Ventilation shaft
Pillar (horizontal)
Auxiliary level
Sublevel I
Slope
Ramp
Sublevel II
Ore
pass
Main shaft
Haulage drift
Main level I
Underground production
Waste pass
Ore pass
Ore body
Manway raise
Under development for production
Main level II
Water basin
Footwall
Underground crusher
Pump station
Hanging wall
Dip
Skip
Ore bin
Winze
Core
drilling
Drift exploration
Skip filling station
Exploration
Sump

Text 5
Improved Machine Performance

Mining depends heavily on mechanical, motor-driven machinery for almost every aspect of the process, from initial extraction to transport to processing. Improving the performance of machinery (thus reducing down time), increasing the efficiency of operation, and lowering maintenance costs would greatly increase productivity. The development and application of better maintenance strategies and more advanced automation methods are two means of improving machine performance.

In recent years new concepts of providing maintenance for large fleets of vehicles, especially vehicles in remote or difficult-to-access areas, have emerged primarily as a result of research sponsored by the U.S. Department of Defense (DOD) and equipment manufacturers. Mining operations are also often conducted in remote locations where access to spare parts and large maintenance facilities may be difficult. Current research has focused on the development of sensor systems that can be incorporated into large vehicles and heavy machinery to monitor continuously the "state of the health" of the vehicle. When problems are detected, the vehicle monitoring system can transmit data directly to a monitoring station at a large repair facility where the problem can be diagnosed, and repair packages can be prepared and shipped to the field before the equipment actually fails. Additional research into sensors, software, and communications could focus on adapting this concept to a variety of mining situations. Leveraging ongoing DOD programs could have substantial payoffs in terms of reduced down time, reduced volume of spare parts stored on site, and lower repair costs.

Better automation and control systems for mining equipment could also lead to large gains in productivity. Some equipment manufacturers are already incorporating human-assisted control systems in newer equipment, and improvements in man-machine interfaces are being made. Additional research should focus on alternatives, however, such as more autonomous vehicles that have both sensor capability and sufficient processing power to accomplish fairly complex tasks without human intervention. Tasks include haulage and mining in areas that are too dangerous for human miners. Semiautonomous control methods should also be explored, such as "fly-by-wire" systems in which the operator's actions do not directly control the vehicle but give directions to a computer, which then decides how to accomplish the action. A good example of this technology is currently being used in large construction cranes; the motion of the crane to move a load from one location to another is controlled by the operator through a computer, which controls the rate of movement of the crane in such a way as to minimize the swing of the load. This technology has considerably improved safety, speeded up cycle time, and enhanced energy conservation in the motion of the crane.

(https://www.nap.edu/read/10318/chapter/5#28)

Text 6
Surface Mining

Surface mining is a generic term describing several methods of mining mineral deposits from the surface, which entails removing the vegetation, top soil, and rock (called overburden materials) above the mineral deposit, removing the deposit, and reclaiming the affected land for postmining land use. The most important factors determining whether surface mining can be done today are economic and technical – the price for the product, the cost of production, the quality and quantity of the deposit, the volume of overburden to be removed per ton of the deposit, and the feasibility of reclamation. The practice of surface mining is quite complex and can involve all or several of the following steps: site preparation, overburden drilling and blasting, loading and hauling overburden (waste), drilling and blasting the deposit, loading and hauling the ore, and reclaiming the site.

Surface mining methods can be broadly classified as open-pit mining, which includes quarrying, strip mining, contour mining, dredging, and hydraulic mining. Topography and the physical characteristics of the deposit strongly influence the choice of method. In open-pit mining waste is transported to a disposal site, and the ore is transported to a downstream processing site. This method commonly involves a sequence of benches from the surface to the deposit. As the open pit goes deeper into the ground, all of the benches above are extended outward. In appearance, an open-pit excavation resembles an inverted pyramid with its tip in the Earth (Figure 3-3). Large open-pit copper mines can produce up to a million tons of waste and ore per day and can be mined at that rate for decades. Quarrying is similar to open-pit mining except the term is commonly applied to the extraction of dimension stone and aggregates. Fewer benches are required in quarrying than in open-pit metal mining (Figure 3-4); in quarrying, most of the material extracted is marketable. In area-strip mining a trench is dug through the overburden to expose the deposit, which is then mined. The trench is then widened by removing the overburden from a parallel adjoining cut and placing it in the previous opening where the deposit has been removed. This method is commonly used in places where the topography and the deposit are generally flat. Reclamation is generally concurrent with mining.

Strip mining is commonly used for mining coal seams and phosphate beds. In hilly terrain the mining of the overburden and the deposit (usually a coal seam) follows the contour around the hill and into the hillside up to the economic limits; hence it is called contour mining. In dredging, a suction device (an agitator and a slurry pump) or other mechanical devices are mounted on a floating barge to dig sand, gravel, or other unconsolidated materials under the water and transport them to land. As the material in a location is exhausted, the dredge moves forward, often constructing and carrying its own lake with it to new ground. Hydraulic mining uses water power to fracture and transport a bench of Earth or gravel for further processing. Hydraulic mining is used for placer deposits of gold, tin, and other metals.

Surface mining equipment is similar to construction equipment (e.g., scrapers, bulldozers, drills, shovels, front-end loaders, trucks, cranes, draglines). Surface mining today is characterized by very large equipment (e.g., trucks that can haul more than 300 tons of rock, loading shovels with buckets greater than 36 cubic meters, draglines with buckets greater than 120 cubic meters), and modern technology for planning, designing, monitoring, and controlling operations.

(https://www.nap.edu/read/10318/chapter/5#28)

Text 7
Weathering Processes

Weathering is the process that changes solid rock into sediments. With weathering, rock is disintegrated into smaller pieces. Once these sediments are separated from the rocks, erosion is the process that moves the sediments away from its original position. The four forces of erosion are water, wind, glaciers, and gravity. Water is responsible for most erosion. Water can move most sizes of sediments, depending on the strength of the force. Wind moves sand-sized and smaller pieces of rock through the air. Glaciers move all sizes of sediments, from extremely large boulders to the tiniest fragments. Gravity moves broken pieces of rock, large or small, down slope. These forces of erosion will be covered later. While plate tectonics forces work to build huge mountains and other landscapes, the forces of weathering and mass wasting gradually wear those rocks and landscapes away, called denudation. Together with erosion, tall mountains turn into hills and even plains. The Appalachian Mountains along the east coast of North America were once as tall as the Himalayas.

No human being can watch for millions of years as mountains are built, nor can anyone watch as those same mountains gradually are worn away. But imagine a new sidewalk or road. The new road is smooth and even. Over hundreds of years, it will completely disappear, but what happens over one year? What changes would you see? What forces of weathering wear down that road, or rocks or mountains over time?

Mechanical Weathering

Mechanical weathering, also called physical weathering, breaks rock into smaller pieces. These smaller pieces are just like the bigger rock, just smaller. That means the rock has changed physically without changing its composition. The smaller pieces have the same minerals, in just the same proportions as the original rock. There are many ways that rocks can be broken apart into smaller pieces. Ice wedging, also called freeze-thaw weathering, is the main form of mechanical weathering in any climate that regularly cycles above and below the freezing point. Ice wedging works quickly, breaking apart rocks in areas with temperatures that cycle above and below freezing in the day and night, and also that cycle above and below freezing with the seasons. Ice wedging breaks apart so much rock that large piles of broken rock are seen at the base of a hillside called talus. Ice wedging is common in Earth’s polar regions and mid latitudes, and also at higher elevations, such as in the mountains. Abrasionis another form of mechanical weathering. In abrasion, one rock bumps against another rock.

Gravity causes abrasion as a rock tumbles down a mountainside or cliff.

Moving water causes abrasion as particles in the water collide and bump against one another.

Strong winds carrying pieces of sand can sandblast surfaces.

Ice in glaciers carries many bits and pieces of rock. Rocks embedded at the bottom of the glacier scrape against the rocks below.

Abrasion makes rocks with sharp or jagged edges smooth and round. If you have ever collected beach glass or cobbles from a stream, you have witnessed the work of abrasion.

Now that you know what mechanical weathering is, can you think of other ways it could happen? Plants and animals can do the work of mechanical weathering. This could happen slowly as a plant's roots grow into a crack or fracture in rock and gradually grow larger, wedging open the crack. Burrowing animals can also break apart rock as they dig for food or to make living spaces for themselves.

Mechanical weathering increases the rate of chemical weathering. As rock breaks into smaller pieces, the surface area of the pieces increases. With more surfaces exposed, there are more surfaces on which chemical weathering can occur.

Chemical Weathering

Chemical weathering is the other important type of weathering. Chemical weathering is different from mechanical weathering because the rock changes, not just in size of pieces, but in composition. That is, one type of mineral changes into a different mineral. Chemical weathering works through chemical reactions that cause changes in the minerals. Most minerals form at high pressure or high temperatures deep in the crust, or sometimes in the mantle. When these rocks reach the Earth's surface, they are now at very low temperatures and pressures. This is a very different environment from the one in which they formed and the minerals are no longer stable. In chemical weathering, minerals that were stable inside the crust must change to minerals that are stable at Earth's surface. Remember that the most common minerals in Earth's crust are the silicate minerals. Many silicate minerals form in igneous or metamorphic rocks deep within the earth. The minerals that form at the highest temperatures and pressures are the least stable at the surface. Clay is stable at the surface and chemical weathering converts many minerals to clay. There are many types of chemical weathering because there are many agents of chemical weathering. Water is the most important agent of chemical weathering. Two other important agents of chemical weathering are carbon dioxide and oxygen.

(https://courses.lumenlearning.com/geophysical/chapter/weathering-processes/)

Text 8
In-Situ Mining

In-situ mining is the "removal of the valuable components of a mineral deposit without physical extraction of the rock" (Bates and Jackson, 1987). In-situ leaching is a type of in-situ mining in which metals or minerals are leached from rocks by aqueous solutions, a hydrometallurgical process (American Geological Institute, 1997). In-situ leaching has been successfully used to extract uranium from permeable sandstones in Texas, Wyoming, and Nebraska, and in-situ leaching of copper has been successfully demonstrated in underground copper mines in Arizona, where prior mining has created sufficient permeability for leaching solutions (lixiviants) to contact ore minerals (Bartlett, 1992, 1998; Coyne and Hiskey, 1989; Schlitt and Hiskey, 1981; Schlitt and Shock, 1979). As used in this report the term in-situ mining includes variations that involve some physical extraction.

In-situ leaching involves the injection of a lixiviant, such as bicarbonate-rich, oxidizing water (with added gaseous oxygen or hydrogen peroxide) in the case of uranium, into the ground to dissolve the metal. The metal is then recovered from the solution pumped to surface-treatment facilities. In-situ leaching technologies are based on geology, geochemistry, solution chemistry, process engineering, chemical engineering, hydrology, rock mechanics and rubblization, and petroleum engineering (Wadsworth, 1983).

Related extraction techniques, herein lumped into the broad category of in-situ mining, include: (1) extraction of water-soluble salts (e.g., halite mined to produce caverns in salt domes in Gulf Coast states); (2) brine extraction (pumping of brines to the surface to remove valuable, naturally dissolved materials, such as lithium in Clayton Valley, Nevada, and zinc from geothermal brines in the Salton Sea in California); (3) sulfur extraction using the Frasch process (wherein hot, high-pressure water is injected to melt sulfur, which is then pumped to the surface, as in west Texas and off-shore Louisiana); (4) bore-hole mining (whereby material is removed by breaking rocks with water jets or other techniques and pumping a slurry of water and broken rock to the surface, an experimental process that was tested on phosphate rock in Florida, uranium-rich sandstones in Wyoming, and bituminous sands in California); and (5) in-situ gasification of coal and in-situ retorting of oil shale (described in the previous section on mining).

In-situ leaching has many environmental advantages over conventional mining because it generates less waste material and causes less surface disturbance (no mill tailings, overburden removal, or waste-rock piles). The major environmental concern is postmining water quality. For example, in the case of uranium, concentrations of uranium and its associated radioactive daughter products and, in some cases, potentially toxic elements, such as arsenic and selenium, could be elevated.

(https://www.nap.edu/read/10318/chapter/5#37)

Text 9
Mining Machine

Within the mining operations, the activity of management and management of machinery for minerals, affects the cost of operation in general, mainly due to the large amount and variability of resources involved in it.

Open pit mining is an industrial activity that involves the removal of large quantities of soil and subsoil, which is then processed to extract the mineral. This mineral may be present in very low concentrations, in relation to the amount of material removed.

Dragline excavator

It is a large excavation machine, so they build it in the place where it will be used, in mining and in civil engineering to move large amounts of material. It is especially useful in places flooded for example for the construction of ports. Its weight easily exceeds 2,000 tons to reach in some cases at 13,000 tons.

The dragline is formed by the following parts:

– The main structure, in the form of a box, which has rotary movement. Here resides the engine, diesel or electric, and the cockpit.
– The mobile arm or mast that supports the loader.
– The loader that is held vertically to the main arm and horizontally to the main structure through cables and ropes
– Cables, ropes and chains that allow the maneuvering of the excavation process.
– It has metal feet because the wheels or caterpillars of the tanks will sink.

Excavator shovel

Excavator shovel or mechanical shovel is a self-propelled machine, on tires or tracks, with a structure capable of rotating at least 360 ° (in one direction and in another, and without interruption) that excavates land, or load, lift, rotate and unloads materials by the action of the spoon, fixed to a set formed by boom and arm or rocker arm, without the supporting structure or chassis moving.

Bucket wheel excavator

It is a continuous production machine in which the functions of starting, loading and transport, within it are separated, the first two being made by the impeller and the last by a system of conveyor belts.

It can excavate 240,000 tons of coal or 240,000 cubic meters of wastewater per day, the equivalent of a 30-meter-deep soccer field. The coal produced in a day filled 2,400 coal cars.

Wheel tractor scrapers

This machine is for transporting earth from one direction to another where it can be seen in the image is not to transport a large amount of land is to carry the specific where it is released by the earth when moving.

Mining Truck

The trucks have been specializing and adopting a series of characteristics of the work to which they are destined in the mines are responsible for transporting the ore and sterile to the dump. In the majority the structure is integrated by a supporting chassis, generally a structural frame, a cabin and a structure to transport the load.

Underground Mining equipment

Soft rock mines, such as coal, do not require the use of explosives for extraction. These rocks can be cut with the tools provided by modern technology. Soft rocks are also salt, potash, bauxite.

In hard rock mines, extraction is carried out by drilling and blasting. First holes are made with compressed air or hydraulic drills. Then holes are inserted into the holes and an explosion is caused to fracture the rock. The blasted rock is loaded into steeply inclined galleries, through which the rock falls into an access shaft. It is loaded into containers called ladles and removed from the mine.

Mining drill

Its technical name is jumbo drilling which the main function of this machine is the drilling of work fronts to subsequently perform the corresponding trimming. This equipment is very effective and reliable which it's working time is much lower than how it was done in the past, which is why it is of great help for bigger and safer productivity.

Underground Loader

The image clearly represents the work of this team called scoop, which is used once the blast has been made on the work front. The work of this team consists of the removal of this material from the forehead to a marine collection point or to emptying pits.

(https://www.gruasyaparejos.com/en/construction-equipment/mining-equipment-names/)

Лексический минимум

1 abandoned workings – закрытые выработки; старые выработки
2 accelerator – катализатор; ускоритель; акселератор
3 access road/ramp – подъездная дорога (к стройплощадке)
4 accident – авария; несчастный случай; катастрофа
5 acidic mine drainage (amd) – кислотный шахтный водоотлив
6 agent – действующая сила; фактор; вещество; реактив
7 alloy – сплав
8 angle – угол
9 anthracitecoal – антрацитовый уголь; беспламенный уголь
10 ash – зола; неорганические остатки после сгорания угля; пепел; зольность
11 auger – шнеко-бурильная машина (для выемки угля); сверло
12 backfill – засыпка; засыпочный материал
13 bank – залежь (руды, угля в открытых разработках); пласт; уступ; верхняя приёмная площадка (ствола шахты)
14 bed – слой; пласт
15 bench – уступ карьера; ступенчатая выемка
16 blasting – взрывные работы; взрывание
17 bituminous coal – жирный уголь; каменный уголь
18 blasting agent – взрывчатый материал
19 block – целик; выемочный участок
20 boom-type excavator – экскаватор со стрелой
21 borehole mining – скважинная добыча с поверхности
22 bottom – подошва выработки; забой скважины
23 boring head – буровая головка; буровой снаряд; вращатель
24 breaker – (камне) дробилка
25 breast and pillar – камерно-столбовая система выемки
26 briquette – прессованный уголь
27 broken rock – отбитая порода, измельченная порода
28 bucket – ковш
29 cable drill – канатный бур
30 capacity – максимальная производительность; мощность
31 charge – зарядить; нагрузить
32 cherry picker – автокран с гидравлическим управлением, агп (автогидроподъемник)

33 clean up – зачищать (забой); извлекать (ископаемое)
34 closure – прекращение; закрытие; завершение
35 coal liquefaction – ожижение угля с получением жидкого топлива; ожижение угля (процесс переработки угля с целью получения жидких углеводородов)
36 coal tar – каменноугольная смола; битум
37 coal-based power plant – электростанция, работающая на угле
38 coke – отложение углерода; твёрдый битум
39 combustion – горение; сожжение
40 competence – крепость; устойчивость (породы)
41 concentrating, concentration – концентрация; обогащение (руды)
42 consolidated rock – плотная/ уплотнённая/ слежавшаяся горная порода
43 crosssection – поперечный разрез
44 crush, crushing, crushed – дробить, дробление, раздробленный; измельчённый
45 crusher rock dust – каменная мелочь, являющаяся отходом камнедробления; породная пыль при дроблении
46 culm dumps – отвал (каменноугольной мелочи)
47 cutterhead – механический рыхлитель
48 cutting head – режущая головка (колонкового долота)
49 debris – пустая порода; наносная порода, покрывающая месторождение; обломки пород
50 deposit – залежь; месторождение; отложившееся минеральное вещество
51 depth – глубина; мощность пласта
52 deslime – очищать от шлама, обезшламливать
53 detonation velocity – скорость детонации (взрывчатых веществ); скорость детонирования (взрывчатых веществ)
54 detonator, detonation wave – детонатор, взрывная волна
55 deslime – очищать от шлама, обезшламливать
56 dewatering – обезвоживание
57 dig (dug, dug) (up) – копать (выкапывать)
58 dimension – размер; размерный, сортовой; штучный
59 dipper – ковш
60 disintegrate – измельчать, разбивать

61 disposal – удаление, утилизация, обезвреживание, захоронение
62 ditch – кювет; траншея; котлован; выемка
63 drag-bit – режущее долото
64 dredge – драга; экскаватор; землесос; судно с землечерпальным устройством
65 dredging – выемка грунта; грунт, разрабатываемый драгой; землечерпательные работы
66 dressing – обогащение руды; выравнивание подошвы выработки
67 drift – горизонтальная подъемная горная выработка
68 drive – горизонтальная выработка; штрек; забивать сваи
69 dry blast hole – взрывная скважина, шпур, направленный снизу вверх
70 dump truck – карьерный самосвал
71 edge coal – наклонный угольный пласт
72 electrical wiring – электрическая проводка; система электропроводов
73 excavate – копать; рыть; выкапывать; откапывать; вынимать грунт; вынуть грунт; рыть котлован
74 exploratory excavation – разведочная выемка (грунта)
75 extinguishing of rock-fall – разборка завала
76 extract, extraction – извлекать; очищать (уголь, руду) выемка минерального сырья
77 face – забой, лава
78 face drilling – обуривание забоя
79 fall – обрушившийся уголь, отбитый уголь; вывал; обрушение
80 fan pipe – вентиляционная труба
81 fan unit – вентиляционная установка
82 field studies – экспедиционные работы
83 firedamp – метановоздушная смесь, метан
84 flat-dipping bed – горизонтально залегающий пласт
85 fluidized bed combustion – сжигание угля в псевдоожиженном слое
86 grindingstand – точило

87 grouting – цементация трещины; заливка раствором (цементным); консолидация грунта (породы); укрепление (породы)
88 hammer – било (дробилки); боёк; поршень (бурильного молотка)
89 handling – выгрузка; доставка; подача; погрузка; разгрузка
90 haul road – карьерная дорога; откаточный путь
91 heap – отвал
92 heavy machinery – тяжёлая техника
93 highwall – откос (уступа угольного разреза)
94 hole – скважина; шпур; сбойка
95 hopper – засыпная воронка, загрузочная воронка; бункер; контейнер
96 hydraulic excavator – землесос (для гидравлической выемки грунта); гидравлический экскаватор
97 hydraulicking – гидродобыча
98 in a single pass – за один заход
99 in-situ – в реальных полевых условиях
100 install, installation – устанавливать инженерное оборудование здания; конструкция; монтаж
101 jackhammer drill – бурильный молоток; пневматический ручной молот
102 jack shaft – слепой ствол
103 lab tested – испытанный в лабораторных условиях
104 landfill – закапывание мусора; свалка мусора
105 landform – форма рельефа; элемент ландшафта
106 load and carry operations – подъёмно-транспортные работы
107 load-haul-dump machine – погрузочно-доставочная машина
108 maintain – обслужить; держать; поддерживать (напр. процесс); содержать (поддерживать в определённом состоянии); сохранять (ухаживать); эксплуатировать (поддерживать в рабочем состоянии)
109 manually – вручную
110 massive rock – массив
111 matrix – материнская или маточная порода; жильная порода
112 mill – горная мельница; скат для руды
113 mine dumps – отвал (в подземной выработке)

114 mine reclamation – восстановление рудника; рекультивация горных выработок
115 mine site – шахт участок; место разработки
116 mined-out – выработанный
117 miner – горняк; горнорабочий; шатёр
118 mineral resources – минерально-сырьевые ресурсы; недра (месторождения полезных ископаемых)
119 mineral values – величина (значение); содержание компонента в руде
120 mining fleet – парк машин и оборудования для горных работ
121 mining machine – горный комбайн
122 mining operations – горные работы
123 mining techniques – методы ведения горных работ
124 moisture – влажность (породы) влагосодержание; влагоёмкость (материала)
125 negotiable – доступный для выемки, добычи
126 non-ferrous ores – неметаллические руды
127 open cast mining – открытая разработка (угля)
128 open pit mining – открытые горнорудные разработки
129 open-cast – разрез; карьер; добытый открытым способом
130 opencast mining – открытые горнорудные разработки
131 open-cut mining – открытая разработка; открытый способ разработки
132 open-pit mining – открытая горная выработка; разнос; открытый карьер
133 ore, ore body – руда рудное тело; массивное месторождение
134 ore lode – рудная жила
135 ore rock – рудная порода
136 outcrop – выход залежи на поверхность
137 output – емкость; производительная мощность
138 overburden (waste, spoil) – нанос (покрывающая порода); покрывающие породы; породы вскрыши; вскрыша
139 overlying layer – вышележащий слой; перекрывающий слой
140 packwall – бутовая кладка; закладка; породная стенка
141 panel – 1) участок, выемочное поле 2) крупный целик (угля)
142 picked rock – отобранная порода
143 pile – навал породы; отвал

144 pillar – целик; предохранительный целик
145 placer – прииск; россыпь
146 probable reserves – возможные (ископаемого); вероятные запасы
147 probe drilling – разведочное бурение; пробное бурение
148 processing facilities – перерабатывающие сооружения
149 production – выработка; добыча
150 production drilling – промышленное бурение; эксплуатационное бурение
151 production rate – объём добычи; норма выработки
152 prospecting drift – разведочная горизонтальная выработка
153 proved reserves – доказанный или действительный запас полезного ископаемого
154 pumping appliance – водоотливное оборудование
155 pumping of coal – гидротранспорт угля
156 quarry – карьер (строительных материалов)
157 quarry boundaries – границы разреза/карьера
158 quarry face – поверхность рабочего; забой при открытых горных работах
159 quarry floor – дно карьера; подошва карьера
160 quarry operator – компания (разрабатывающая месторождение), добывающая компания
161 quarrying – карьерная выемка
162 rank of coal – марка угля
163 reclamation – восстановление плодородия земли
164 recover – извлекать
165 restoration – рекультивация (земель)
166 reverse circulation drill rig – станок вращательного бурения
167 rock dumps – породный отвал (карьера)
168 rock formation – горные породы; породная формация; свита (пород)
169 rockfall – вывал породы; обрушение породы
170 roofing – перекрытие; кровля выработки
171 rotary drill – бурильная машина вращательного действия; вращательный бур; вращающийся перфоратор
172 rotating drum – вращающий барабан

173 screening – фильтрация; просеивание; улавливание; сортировка
174 scrub scrubber – очищать; уничтожать; избавляться мокрый пылеуловитель; мокрый газоочиститель; поглотительная башня (в производстве кокса)
175 shaft – ствол шахты
176 shearer – очистной комбайн; врубовая машина для вертикальной зарубки
177 shelf life – срок хранения
178 shovel – механическая лопата; совковая лопата; одноковшовый экскаватор; скребковый разгрузчик; ковш экскаватора; мех лопата
179 shovel operator – экскаваторщик
180 slope – откос уступа (на открытых работах)
181 soil mechanics – механика грунта
182 spoil – 1) отвал (грунта) 2) уголь, смешанный с породой
183 strength – сопротивление (материала)
184 strip stripping – вскрывать (верхний слой грунта); разрабатывать вскрыша; вскрышка; выемка нулевого слоя (над откаточным штреком); выемка целиков
185 strip mining – открытые горные работы; разработка открытым способом
186 strip ratio – коэффициент вскрыши
187 subsurface mining – подземные горные работы
188 surface blasting – бурение взрывных скважин на открытых горных разработках
189 surface mining – открытый карьер
190 tailings – хвосты (пустая порода)
191 tailings impoundments – хвостохранилище наливного типа
192 tails – хвосты (горно-обогатит. предприятий); хвосты (пустая порода)
193 tractor-trailers – трактор с прицепом
194 transmission line – линия передачи; трансмиссионная линия
195 void – пустое пространство; пустой карман в породе; пустота в породе
196 waste area – выработанное пространство

197 waste disposal – сбор отходов; утилизация отходов производства
198 water truck – водовозка, автоцистерна для орошения карьерных дорог; автоцистерна для орошения
199 wire rope – трос
200 yearly advance of face – годовое продвигание забоя

Глоссарий

A

accelerator (n) – a foot pedal of a car that controls the speed.

adit (n) – a nearly horizontal passage from the surface into a mine. adit level (n) – mine workings on a level with an adit.

adit portal (n) – a nearly horizontal passage from the surface by which a mine is entered and dewatered.

asset (n) – an advantage or resource.

B

base metals (n) – any of certain common metals, such as copper, lead, zinc and tins as distinct from the precious metals, gold, silver and platinum.

blaster (n) – a person who is responsible for placing and detonating of explosives to demolish structures or to loosen, remove, or displace earth, rock, or other materials.

bolter (n) – a person who operates machinery to install roof support bolts in underground mine.

brattice builder (n) – a person who builds doors or ventilation walls or partitions in underground passageways to control the proper circulation of air through the passageways and to the working place.

breakdown (n) – a sudden failure in operation or effectiveness.

broken ore (n) – rock or mineral formations fragmented by blasting with explosives.

bulk (n) – a distinct mass or portion of matter, especially a large one.

bulldozer (n) – a powerful machine used for pushing heavy objects, earth etc. out of the way when a level surface is needed.

C

cable bolt (n) – suited to stabilize rock surfaces, particularly to withstand loads.

caution (n) – alertness and prudence in a hazardous situation; care. commodity (n) – an article of trade or commerce, especially a mineral. component (n) – a constituent element, as of a system.

concentrate (n) – the desired mineral that is left after impurities have been removed from mined ore.

concentration (n) – the measure of the amount of a substance contained in aliquid.

confined (n) – limited or restricted.

contamination (n) – smth. that is impure or unsuitable by contact or mixture with unclean, bad materials, substances, etc.

continuous mining (n) – the method of rock extracting that means equipment that constantly extracts coal (or other rocks) while it loads it.

contract company (n) – a professional management consultancy for companies seeking qualified individuals, methods and technology to assist with strategic initiatives.

core sample (n) – a cylindrical section of a naturally medium consistent enough to hold a layered structure.

crane (n) – a machine for lifting and moving heavy objects by means of a very strong rope or wire fastened to a long movable arm.

cumulative production (n) – a knowledge of what has been produced is the understanding of current resources.

D

danger (n) – exposure or liability to injury, pain, harm or loss.
depletion (n) – the act of decreasing smth.

deposit (n) – an accumulation or layer of solid material, either consolidated or unconsolidated, left or laid down by a natural process.

development mining (n) - work undertaken to open up coal reserves as distinguished from the work of actual coal extraction.

raise (development) (n) – a shaft which joins two levels by definition mined upwards.

differentiation (n) – chemical zonation caused by differences in the densities of minerals.

dragline (n) – a large excavation machine used in surface mining to remove overburden (layers of rock and soil) covering a coal seam.

dragline mining (n) – one of surface mining methods which uses draglines.

dragline operator (n) – a person who operates power-driven crane equipment with dragline bucket to excavate or move sand, gravel, mud, or other materials.

dredge (dredging) (v) – to bring to the surface of water using a dredger.

dredge operator (n) – a person who operates power-driven dredges to mine sand, gravel, or other materials from lakes, rivers, or streams; and to excavate and maintain navigable channels in waterways.

dump (n) – the mechanism for unloading, e.g. a car dump (sometimes called tipple); or, the pile created by such unloading, e.g. a waste dump (also called heap, pile, tip, spoil pike, etc.)

E

economic (n) – extraction of the ore reserve has been established or analytically demonstrated to be viable and justifiable under reasonable investment assumptions.

electric power generation (n)-large-scale production of electric power for industrial, residential and rural use.

engineering technician (E-technician) (n) – a person who has relatively practical understanding of the general theoretical principles of the specific branch of engineering in which they work.

environmental impact (n) – possible effect-positive or negative- on the environment (surroundings), including natural, social and economic aspects.

exploration (n) – the act or process of exploring.

explosive (n) – any rapidly combustive or expanding substance. The energy released during this rapid combustion or expansion can be used to break rock.

extraction (n) – the process of mining and removal of ore from a mine.

F

feasibility (n) – the determination as to whether the assigned tasks could be accomplished by using available resources.

feature (n) – a prominent \ distinctive part (aspect) of a landscape.

ferroalloy metals (n) – any of various alloys of iron and one or more other elements, such as manganese or silicon used as a raw material in the production of steel.

fissionable metals (n) – capable of undergoing nuclear fission as a result of any process.

foul (air) (n) – containing or characterized by offensive matter or material.

G

gangue (n) – unwanted material, minerals or rock, with which ore minerals are usually intergrown; valueless and undesirable material, such as quartz in small quantities, in an ore.

gold (n) – a soft, yellow, corrosion-resistant element, the most malleable and ductile metal, occurring in veins and alluvial deposits

geologist (n) – one who studies the constitution, structure, and history of the earth's crust, conducting research into the formation and dissolution of rock layers, analyzing fossil and mineral content of layers, and endeavoring to fix historical sequence of development by relating characteristics to known geological influences (historical geology).

grade (n) – a position in a scale of size, quality or intensity.

grain distribution (n) – classification of the relative size of the particles composing a substance or pattern.

H

haulage (n) – horizontal transport of ore, coal, supplies, and waste. The vertical transport of the same is called hoisting.

haulage drift (level) (n) – the arteries of a mine as they transport the valuable minerals out of the mining zone.

hazard (n) – anything that has the potential to cause harm.

host rock (n) – rock which serves as a host for other rocks or mineral deposits.

hypogene (n) – formed or situated below the earth's surface.

hypothetical resources (n) – undiscovered resources that are similar to known ones and that may be reasonably expected to exist in the same producing distribution of analogous geologic conditions.

I

incline (n) – any entry to a mine that is not vertical (shaft) or horizontal (adit). Often incline is reserved for those entries that are too steep for a belt conveyor (+17 degrees -18 degrees), in which case a hoist and guide rails are employed.

incline (d) shaft (n) – secondary inclined opening, driven upward to connect levels, sometimes on the dip of a deposit.

identified resources (n) – resources whose location, grade, quality and quantity estimated from specific geologic evidence.

indicated resources (n) – quantity and grade and (or) quality are computed from information used for measured resources.

industrial minerals (n) – any rock, mineral or other naturally occurring substance of economic value, exclusive of metallic ores, mineral fuels and gemstones.

inferred resources (n) – estimates are based on an assumed continuity beyond measured resources, for which there is geologic evidence.

infrastructure (n) – the system or structures which are necessary for the operation of a country or an organization.

intergrowth (n) – the growing together of crystals from two or more minerals. invade (v) – intrude upon, encroach on.

investigation (n) – a searching inquiry for ascertaining facts; detailed or careful examination.

iron (n) – silvery-white, lustrous, malleable ductile magnetic, metallic element occurring abundantly in combined forms.

L

label (n) – short word or phrase describing or indicating a procedure, movement or action.

leaching (n) – separation a substance from material by passing water through the material.

lead (n) – soft, malleable, ductile, bluish-white, dense metallic element, extracted chiefly from galena.

life cycle (n) – a progression thoroughly a series of differing stages of the development.

load-haul dump machine (n) – a machine allowing safely to extract ore from dangerous zones.

loading station (pocket) (n) – transfer point at a shaft where bulk material is loaded by bin, hopper, and chute into a skip.

longwall machine (n) – equipment (machine) with a plow or rotation drum which goes back and forth across a face of coal.

longwall mining (n) employs rotation drum, which is pulled mechanically back and forth across a face of coal. The loosened coal falls onto a conveyor for removal from the mine.

M

marginal reserves (n) – part of the reserve base which at the time of borders on being economically producible.

marketing (n) – the branch of business concerned with advertising.

mechanical engineer (n) – a person who performs engineering duties in planning and designing machineries and mechanical equipment, oversees installation, operation, maintenance, and repairs of such equipment as centralized heat, gas, water, and steam systems.

mercury (n) – a silvery-white poisonous metallic element, liquid at room temperature.

measured reserves (n) – quantity is computed from dimensions revealed in outcrops or drill holes; grade and (or) quality are computed from the results of detailed sample inspection, sampling and measurements are spaced so closely and the geologic parameters defined that size, shape, depth and mineral content of the resource are well established.

mill (mineral dressing plant) (n) – building equipped with machinery for processing raw materials into finished or industrial products.

mineral (n) – a naturally occurring homogeneous inorganic solid substance having a definite chemical composition and characteristic crystalline structure, color and hardness.

mineral deposit (n) – minerals that have been laid (set) in rock by a natural process.

mineral occurrences (n) – prospect of geological interest but not necessarily of economic interest.

mineral resources (n) – valuable mineral deposits of an area that are presently recoverable and may be so in the future, includes known ore bodies and potential ore.

mineral separation (processing) (n) – treating crude ores and mineral products in order to separate the valuable minerals from the waste rock (gangue). It's the first process that most ores undergo after mining in order to provide a more concentrated material for the procedures of extractive metallurgy.

mineralization (n) – introduction of minerals into a rock resulting in a mineral deposit.

mineralogical form (n) – the properties of a mineral that govern the ease with which existing technology can extract and refine certain metals.

mining engineer (n) – a person who determines the location and plans ways of extraction of any natural resources.

N

nature (n) – essential characteristics and qualities of a thing. non-metal mining (n) – extraction of non-ferrous metals.

non-renewable resources (n) – a natural resource which cannot be produced, re-grown, regenerated or reused on a scale which can sustain its consumption rate.

O

open pit (n) – a method of extracting rock (minerals) from the earth by their removal from an open pit.

ore (n) – a metalliferous mineral, or an aggregate of metalliferous minerals, which can be profitable.

ore bin (n) – a container for ore awaiting treatment or shipment.

ore body (n) – portion of a mineralized envelope within which ore reserves have been defined.

ore character (n) – is the type of ore that affects the mining operations.

ore dressing (n) – treatment of ores to concentrate their valuable minerals into products (concentrate) of smaller bulk and simultaneously to collect the gangue (worthless mineral) into tailing (discardable waste).

ore grade (n) – concentration of a metal in an orebody.

ore minerals (n) – minerals (galena, sphalerite) that form the economic portion of the mineral deposit.

ore reserves (n) – economically mineable part of a measured or indicated mineral resource.

outline (n) – a line showing the shape of something.

overburden rock (n) – rock overlying the mineral deposit and is removed. overseeing (n) – supervision or management.

P

precaution (n) – a measure taken in advance to avert possible harm or to secure good results.

percentage (n) – result obtained by taking a given percent of a given quantity.

percolating (n) – process of passing slowly through a material that has small holes in it.

placer (n) – a glacial or alluvial deposit of sand or gravel containing eroded particles of valuable minerals.

possible ore (indicated) (n) – may indicate enough information to infer that ore extends for some way into only partially explored ground and that it may amount to a certain volume and grade.

precious metals (n) – any of the less common and valuable metals often used to make coins and jewelry.

precipitating (n) – a substance that is precipitated (become insoluble) from a solution or gas.

pre-feasibility (n) – a comprehensive study of the viability of a mineral project that has advanced to a stage where the mining method has been established and an effective method of mineral processing has been determined.

protore (n) – mineral material in which an initial but uneconomic concentration of metals has occurred that may by further natural processes be upgraded to the level of ore.

proved ore (measured) (n) – ore in which there is practically no risk of failure of continuity.

Q

quarry (ing) (n) – a place from which stones or sand are dug out.

R

raise (n) – a secondary or tertiary inclined opening, vertical or near-vertical opening driven upward form a level to connect with the level above, or to explore the ground for a limited distance above one level.

rearrangement (n) – a chemical reaction involving a change in the bonding sequence within a molecule.

reconnaissance (n) – exploration of an area, especially one made to gather necessary information.

recovery (n) – act of obtaining usable substances from unusable substances. reduction (n) – the amount by which anything is decreased.

refining (n) – purifying or improving.

related non-metals (n) – any of those elements lacking the characteristics of a metal.

removal (n) – a taking away or being taken away. reposition (n) – replacement.

reserve (n) – that part of the reserve base which could be economically extracted at the time of determination (include only recoverable materials).

residual deposits (n) – a mineral deposit formed by the weathering of pre- existing rocks and the removal of disintegrated material.

residual (solution) (n) – a quantity left over at the end of a process. resistance (n) – opposition of some force, thing, etc. to another orothers.

resources (n) – a concentration of naturally occurring solid, liquid, or gaseous forms of the Earth's crust in such form and amount that economic extraction of a certain concentration is currently or potentially feasible.

reworking (n) – any geologic material that has been removed or displaced by natural agents from its origin and incorporated in a younger formation.

rich in (n) – having valuable resources.

risk (n) – the likelihood that illness, injury, or even death might result

rock dust machine (n) – a machine that distributes rock dust over the interior surfaces of a coal mine by means of air to prevent coal dust explosions.

rock splitter (n) – a person who splits rough dimension stone into smaller units, such as paving blocks, ashlar, or rubble.

roof bolt (n) – a long steel bolt driven into the roof of underground excavations to support the roof, preventing and limiting the extent of roof falls.

S

safety (n) – the quality of averting or not causing injury, danger or loss.

safety inspector (n) – an engineer who controls the whole mining process to be safe for the workers and environment.

shaft (n) – a primary vertical or non-vertical opening through mine strata used for ventilation or drainage and/or for hoisting of personnel or materials; connects the surface with underground workings.

shaft mine (n) – an underground mine in which the main entry or access is by means of a vertical shaft.

shaft pillar (n) – a large area of an ore seam which is left unworked around the shaft bottom to protect the shaft from damage by subsidence.

shuttle car (n) – a self-discharging truck, used for receiving coal from the loading or mining machine and transferring it to an underground loading point, mine railway or belt conveyor system.

silver (n) – metallic chemical element, nearly white, lustrous, soft, very ductile, malleable and an excellent conductor of heat and electricity.

slope (n) – a belt conveyor incline.

smelting (n) – (metallurgy) any process of melting, especially to extract a metal from its ore.

solidification (n) – a process of a substance becoming solid, hard or firm.

speculative resources (n) – undiscovered resources that may occur either of deposits in favorable geologic settings where mined discoveries have not been done or deposits as yet unrecognized for their economic potential.

stope (n) – underground spaces produced by stopping.

stopping (n) – removal of the wanted ore from an underground mine leaving behind an open space.

stripping ratio (n) – unit amount of spoil or waste that must be removed to gain access to a similar amount of ore or mineral material.

sublevel (n) – an intermediate level opened a short distance below the main level (or 4.6 -6.1m. level below the top of the ore body, preliminary to caving the ore between it and the level above).

subeconomic resources (n) – part of identified resources that does not correspond to criteria of reserves and marginal reserves.

supergene (n) – enrichment occurring relatively near the surface.

surface mine (n) – a mine in which the coal lies near the surface and can be extracted by removing the covering layers of rock and soil.

surface mining (n) – a way of extracting the coal which lies near the surface and can be extracted by removing the covering layers of rock and soil.

surrounding rock (country rock) (n) – rock native to an area.

T

tailing (n) – refuse or dross (шлак) remaining after ore has been processed. tonnage (n) – weight measured in tons.

truck (n) – AmE a large motor vehicle for carrying goods in large quantities.

U

unconsolidated (n) – loose or unstratified.

underground mining (“deep" mine) – (n) – a way of extracting coal or other minerals which are located several hundred feet below the earth's surface.

undesirable substance (n) – the present of harmful substances in ore and gangue minerals.

undiscovered resources (n) – resources the existence of which are only possible deposits.

unmined ore (n) – discovered, but eventually not mined because of the small size or the high costs of mining.

V

viability (n) – a capacity for developing under favorable conditions.

W

wall rock (n) – a rock that is immediately adjacent to a mineral vein, fault or igneous intrusion.

warning (n) – smth. that serves to give notice or advice of danger, possible harm or anything else unfavorable.

waste dump (n) – a site for the disposal of waste material by burial.

waste rock (n) – valueless rock that must be fractured and removed in order to gain access to or upgrade ore.

wasting asset (n) – a fixed asset, such as a mine, that diminishes in value over time.

winze (n) – secondary or tertiary vertical or near-vertical opening sunk from a point inside a mine for the purpose of connecting with a lower level or of exploring the ground for a limited depth below a level.

Библиографический список

1. Журавлёва Р.И. Английский для горняков English For Mining Technology, Издательство "КноРус", 2011
2. Киткова Н.Г., Сафьянникова Т.Ю., Effective English for geo-students Эффективный курс английского языка для студентов-геологов, Москва, 2006
3. Болсуновская Л.М., Абрамова Р.Н., Белоусова О.В., Долгая Т.Ф., Овчинникова Е.С., Снисар А.Ю. Учебно-методическое пособие по английскому языку, Томск: Изд-во Томского политехнического университета, 2009
4. Журова Т.В. Английский язык для студентов-геологов, Учебное пособие, Ухта: УГТУ, 2009
5. Титова Л.Н., Юницкая Л.Г., Ненахов В.М. Introduction to Geology, Учебно-методическое пособие по английскому языку для студентов, обучающихся по специальностям Геология, Воронеж, 2000

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