ИНОСТРАННЫЙ ЯЗЫК

ЭЛЕКТРИФИКАЦИЯ И АВТОМАТИЗАЦИЯ ГОРНОГО ПРОИЗВОДСТВА

Методические указания к практическим занятиям для студентов специальности 21.05.04

FOREIGN LANGUAGE

POWER SUPPLY AND AUTOMATION IN MINING

САНКТ-ПЕТЕРБУРГ
2019

Министерство науки и высшего образования Российской Федерации

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Санкт-Петербургский горный университет

Кафедра иностранных языков

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ИНОСТРАННЫЙ ЯЗЫК. Электрификация и автоматизация горного производства: Методические указания к практическим занятиям / Санкт-Петербургский горный университет. Сост.: *М.А. Глазун, Е.В. Виноградова.* СПб, 2019. 46 с.

Предлагаемый материал направлен на совершенствование навыков профессионально-ориентированного чтения на английском языке. Методические указания включают тексты на языке оригинала, а также разработанный комплекс лексико-грамматических упражнений и заданий, способствующих развитию речевой, языковой, социокультурной и информационной компетенций студентов, необходимых для общения в сфере профессиональных интересов. Предназначены для практических занятий по английскому языку со студентами 2-го курса.

Методические указания предназначены для студентов специальности 21.05.04 «Горное дело» специализации «Электрификация и автоматизация горного производства» и согласованы с программой по иностранному языку для студентов неязыковых вузов.

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ПРЕДИСЛОВИЕ

Данные методические указания предназначены для учебно-методического сопровождения курса английского языка для студентов неязыковых вузов, обучающихся по специальности 21.05.04 «Горное дело», специализация «Электрификация и автоматизация горного производства».

Изучение материала преследует цель развития навыков и умений просмотрового и изучающего чтения текстов по направлению подготовки, а также их перевода на русский язык с последующим использованием полученной информации для речевой практики; овладение студентами иноязычной коммуникативно-речевой компетенцией, позволяющей будущему специалисту осуществлять профессиональную коммуникацию; формирование активного словарного запаса, который включает наиболее употребительные английский термины и выражения по теме «Power supply and automation in mining».

Методические указания состоят из тематических разделов, каждый из которых посвящен одному из аспектов, связанных с электрификацией и автоматизацией горного производства. Задания для чтения и перевода составлены на материале текстов в оригинале и сопровождаются специально разработанными лексико-грамматическими упражнениями, направленными на активизацию когнитивной деятельности обучающихся, освоение нового лексическо-грамматического материала, и способствуют развитию коммуникативных навыков в сфере профессионального общения на английском языке.

UNIT 1. TYPES OF MINING

I. Read and translate the following text. Fill in the table:

WHAT IS MINING? TYPES OF MINING

Mining is the extraction of valuable minerals or other geological materials from the Earth, from an ore body, lode, vein, seam or reef, which contains materials of economic interest. The materials of economic interest recovered by mining include base metals, precious metals, iron, uranium, coal, diamonds, limestone, oil shale, rock salt and potash. Mining is required to obtain any material that cannot be grown through agricultural processes, or created artificially in a laboratory or factory.

Mining of stone and metals has existed since pre-historic times. Modern mining processes involve prospecting of ore bodies, analysis of the profit potential of a mine, extraction of the desired materials and finally reclamation of the land.

The first stage is discovery of the ore body, which is carried out through prospecting or exploration to find and then define the extent, location and value of the ore body. This leads to resource estimation of the size and grade of the deposit for pre-feasibility study. The second step is the feasibility study to evaluate the financial viability, technical and financial risks and robustness of the project.

Next stage is the access to the ore body. The mine buildings and processing plants are built and any necessary equipment is obtained. The operation of the mine to recover the ore begins and continues as long as the company operating the mine finds it economically profitable. When all the ore that the mine can produce profitably is recovered, reclamation begins to make the land used by the mine suitable for future use.

Mining techniques can be divided into two common types: surface mining and sub-surface (underground) mining.

Surface mining is much more common, and produces, for example, 85% of minerals, including 98% of metallic ores. Surface mining is done by removing (stripping) surface vegetation, dirt, and if necessary, layers of bedrock in order to reach buried ore deposits. Techniques of surface mining include: open-pit mining which consists of recovery of materials from an open pit in the ground, quarrying or gathering building

materials from an open pit mine, strip mining which consists of stripping surface layers off to reach ore deposits at depth. Most placer deposits, because of their shallowly buried nature, are mined by surface methods.

Underground mining consists of digging tunnels or shafts into the earth to reach buried ore deposits. Ore, for processing, and waste rock, for disposal, are brought to the surface through the tunnels and shafts. Sub-surface mining can be classified by the type of access shafts used, the extraction method or the technique used to reach the mineral deposit. Drift mining utilizes horizontal access tunnels, slope mining uses diagonally sloping access shafts and shaft mining consists of vertical access shafts. Mining in hard and soft rock formations require different techniques. Other methods include shrinkage slope mining which is mining upward creating a sloping underground room, long wall mining which is grinding a long ore surface underground and room and pillar which is removing ore from rooms while leaving pillars in place to support the roof of the room.

Mining techniques

Surface mining techniques	**Underground mining techniques**

II. Study the following words and expressions paying attention to the correct translation:

resource estimation – оценка запасов, pre-feasibility [fi:zə'bɪlɪtɪ] study – предварительное технико-экономическое обоснование, feasibility study – технико-экономическое обоснование, viability [vaɪə'bɪlətɪ] of the project – жизнеспособность проекта, quarrying ['kwɔrɪŋ] – разработка карьера, strip mining – открытая горная разработка, вскрышные работы, slope mining – разработка наклонными выработками, drift mining – разработка штольнями, longwall mining – выемка длинными забоями (лавами), механизированная выемка, shrinkage stope mining – разработка с маганизированием,

room and pillar mining method – камерно-столбовая система разработки, placer deposits – прииски, россыпные месторождения.

Vocabulary

bedrock – коренная подстилающая порода
deposit – месторождение
exploration – разведочные работы
mining operations – горные работы; горнодобывающее производство
mining techniques – методы ведения горных работ
open-pit mining – разработка открытым способом
ore – руда
ore body – рудное тело
overburden – породы вскрыши
pillar – целик
processing plant – обогатительная фабрика; обогатительная установка
prospecting – изыскательские работы
reclamation of land – рекультивация земли, восстановление земли
recover – извлекать, добывать
rock – порода
room – выемочная камера
seam– пласт
shaft – ствол шахты
stripping – вскрышные работы
surface mining – открытые горные работы
underground mining – подземные горные работы
vein – жила

III. Put the stages of mining processes in the correct order:

Prospecting for ore body, feasibility study, discovery of the ore body, reclamation of the land used by the mine, access to the ore body, resource estimation, pre-feasibility study.

IV. Mark the following statements as True or False:

1. Underground mining consists of stripping the surface vegetation with subsequent removal of the overburden to reach buried ore deposits.

2. Modern mining processes involve prospecting of ore bodies, analysis of the profit potential of a proposed mine, extraction of the desired materials and finally reclamation of the land.
3. Mining is required to obtain materials of economic interest.
4. The feasibility study is carried out through prospecting or exploration to find and then define the extent, location and value of the ore body.
5. Mining techniques can be divided into two common types: quarrying and strip mining.
6. Exploration and prospecting are used to evaluate the financial viability, technical and financial risks and robustness of the project.
7. Surface mining is less common than underground mining.

V. Answer the following questions:

1. What is the basic definition of mining?
2. What types of mining can you name?
3. What do you know about prospecting and exploration?
4. What does the feasibility study consist of?
5. How is the access to the ore body gained?
6. What is the difference between the surface and underground mining techniques?
7. Describe the peculiarities of drift mining, slope mining, shrinkage mining, long wall mining.

VI. Match the left and the right:

Mining	evaluation of the financial viability, technical and financial risks and robustness of the project.
The materials of economic interest	has existed since pre-historic times.
Reclamation	are base metals, precious metals, iron, uranium, coal, diamonds, limestone, oil shale, rock salt and potash.

Mining of stone and metals	is the extraction of valuable minerals or other geological materials from the earth, from an ore body, lode, vein, (coal) seam or reef, which contains materials of economic interest to the miner.
Modern mining processes	making the land used by the mine suitable for use.
Feasibility study	finding and then defining the extent, location and value of the ore body.
Prospecting	involve prospecting of ore bodies, analysis of the profit potential of a proposed mine, extraction of the desired materials and finally reclamation of the land.

VII. Insert the missing words and expressions:

Surface mining, Underground mining, discovery, reclamation, valuable minerals, economic interest

1. Mining is the extraction of _____or other geological materials from the earth, from an ore body, lode, vein, seam or reef, which contains materials of _____to the miner.
2. _____is done by removing surface vegetation, dirt, and if necessary, layers of bedrock in order to reach buried ore deposits.
3. _____consists of digging tunnels or shafts into the earth to reach buried ore deposits.
4. The first stage is _____of the ore body, which is carried out through prospecting or exploration to find and then define the extent, location and value of the ore body.
5. When all the ore that the mine can produce profitably is recovered, _____begins to make the land used by the mine suitable for future use.

VIII. Translate the sentences into English, using the active vocabulary:

1. Горные работы проводятся с целью добычи полезных ископаемых, которые невозможно вырастить или получить искусственным путем в лаборатории или на заводе.
2. Технико-экономическое обоснование заключается в оценке жизнеспособности проекта, его надежности, технических и финансовых рисков.
3. Современные горные работы включают изыскательные работы, рассмотрение целесообразности возведения рудника, добычу полезных ископаемых и рекультивацию земли.
4. Открытые горные работы проводятся путем удаления растительного покрова, почвы и, по необходимости, пород вскрыши для обнаружения скрытых рудных месторождений.
5. Подземные горные работы проводятся путем прокладывания штольни или стволов шахты для получения доступа к рудному телу.
6. Большинство россыпных месторождений разрабатываются открытым способом.

IX. Open the brackets and transform the sentences into Passive voice.

1. The deposit (to discover) by geologists in the late 1970s.
2. Transmission lines can also (to use) to carry data.
3. We (not, to invite) to the conference yet.
4. Much attention (to give) at present to the modern equipment of research laboratories.
5. Advanced technologies (to apply) in most branches of engineering.
6. When the engineer came, the problem (to solve) by the workers.
7. The problem (to discuss) at 5 p.m. yesterday.
8. The cables (to connect) by our electrician by 6 p.m.
9. More than half a century ago the phenomenon of superconductivity (to discover).
10. A new gold deposit (to develop) now.

X. Match Column A with Column B to make correct sentences using the Past Simple Passive. Then, in pairs, ask and answer questions, as in the example:

For example:
- Who was the mining machine invented by?
- It was invented by two students Jonny and Jonathan from Austintown middle school in Ohio for a science project.

Column A	**Column B**
1. Periodical table of chemical elements (to discover)	a. Conrad Roentgen
2. X-rays	b. Albert Einstein
3. The Eiffel Tower (to build)	c. Thomas Edison
4. The first computer (to make)	d. Mendeleev
5. The theory of relativity (to discover)	e. Charles Babbage
6. America (to discover)	f. Gustave Eiffel
7. The electric bulb (to invent)	g. Christopher Columbus
8. The telephone (to invent)	h. Alexander Graham Bell

XI. Translate into English using Passive Voice.

1. Геологи были отправлены в исследовательскую экспедицию на прошлой неделе. 2. В этом магазине продают инструменты хорошего качества. 3. Рабочим уже выдали новые комплекты рабочей одежды. 4. Меня учили водить автомобиль все прошлое лето. 5. Нам расскажут про виды добычи на следующем занятии. 6. Когда мы пришли, его автомобиль уже отремонтировали. 7. Новый проект будет закончен завтра. 8. Вчера у шахтеров брали интервью. 9. Когда установят новый трансформатор? 10. Твою машину ремонтируют сейчас?

XII. A. Find additional information about types of mining and make a report using Power Point or similar software.
B. Imagine that you are a lecturer. Tell about mining techniques and stages of mining process.

UNIT 2. SAFETY IN MINES

I. Read and translate the following text. Make up the plan of the text.

Mining is potentially a very dangerous occupation. Safety has long been a concern in the mining business especially in sub-surface mining.

Mining ventilation is a significant safety concern for many miners. Insufficient ventilation of the mines causes exposure to harmful gases, heat and dust inside sub-surface mines, which can cause injury, illness and death. Rock dusts, including coal dust and silicon dust can cause serious lung problems.

Gases in mines can poison the workers or displace the oxygen in the mine, causing asphyxiation. Ignited methane gas is a source of explosions in mines. Frictional heat and sparks generated by mining equipment can ignite methane gas. Powerful mining equipment for breaking through extremely hard layers of the Earth's crust in combination with the reverberant effects of underground mines can cause high risks of hearing loss.

Since mining entails removing dirt and rock from its natural location creating large empty pits, rooms and tunnels, cave-ins as well as ground and rock falls are a major concern within mines. Modern techniques for support and bolting of walls and ceilings within sub-surface mines have reduced the number of fatalities due to cave-ins, but ground falls continue to represent up to 50% of mining fatalities. High temperatures and humidity may result in heat-related illnesses, including heat stroke which can be fatal.

The use of heavy electrical equipment such as drills, industrial machines and lighting always creates serious dangers for mining teams. If the mining environment is damp, workers can easily be electrocuted. Cables or plugs can trigger sparks that cause explosions. The use and storage of electrical equipment must be carefully monitored.

Many injuries can be prevented by wearing the correct protective clothing or gear required to perform many different mining activities. The first purpose of protective gear is Improved Visibility — Be Visible Be Seen is a road safety slogan which is also true for the mining. Higher-visibility gear is important at the mine and especially when dealing with traffic at the mining site. The second purpose of protective gear is Impact Protection. Thick, tough leather provides the most abrasion resistance in case of an accident. Helmets with internal padding ensure protection of the head and neck. The third purpose is Weather Protection. An important aspect of protective clothing is protection from the elements. Extreme weather can sometimes make working conditions unbearable or dangerous. Gear needs to provide protection from wind, rain and cold.

And the last but not the least is rescue equipment such as breathing mask or self-rescue breathing apparatus and miner's headlamp with battery. No miner is allowed in the mine without safety clothing and equipment.

Vocabulary

accident – несчастный случай
asphyxiation – асфиксия, удушье
blasting – взрыв
breathing mask – дыхательная маска
cause explosion – вызывать взрыв
cave-in - обрушение
electrocute – убивать электрическим током
ensure protection – обеспечивать защиту
explosive – взрывчатое вещество
flammable gas – горючий газ
gloves – перчатки, рукавицы
harmful - вредный, губительный
headlamp – головная лампа
hearing loss – потеря слуха
heatstroke – тепловой удар
helmet – шлем, каска
high-visibility gear – светоотражающая экипировка
humidity – влажность
ignite – воспламенять
impact protection – защита от удара
improved visibility – повышенная видимость;
injury – повреждение
methane – метан
oxygen– кислород
poison – отравлять

protective clothing – спецодежда, защитная одежда
protective gear– защитная экипировка
rescue equipment – спасательное оборудование
rock fall – обвал породы
safety procedure – техника безопасности

II. Discuss the following.

1. Do you agree that mining is one of the most dangerous occupations in the world?
2. What can cause mining accidents?
3. How can insufficient ventilation of a mine affect people's health?
4. Why is the use of electrical equipment in a mine especially dangerous?
5. Prove on the importance of protective clothing and rescue equipment.
6. What safety measures can be applied in mines to prevent accidents and harmful effects of mining on people's health?

III. Match the left and the right:

flammable	procedure
safety	lamp
rock	clothing
hearing	gear
heat	visibility
protective	protection
high-visibility	equipment
improved	illnesses
ensure	mask
heat-related	effect
head	stroke
rescue	fall
breathing	loss
harmful	gas

IV. Complete the sentences with the words from A and B and insert the missing word combinations in the following sentences:

A	B
Mine	Chemicals
Toxic	Procedures
Gas	Explosion
Coal-dust	Collapses
Safety	Leaks

1. One of the most common of all underground mining accidents, _____, occur when the walls and ceilings of underground mine-shafts have not been properly secured.
2. Mining involves the use of many _____.
3. Fires can occur in mines for a range of reasons, the most common being _____.
4. A _____ ripped through this mine in Northern France on March 10, 1906.
5. _____ need to be carefully followed to reduce risk factors.

V. Translate into Russian. Find Participle.

1. Having finished the experiments the engineers started to construct a new device. 2. A neutron is a particle having the same mass as a proton but carrying no electric charge. 3. The results obtained were carefully analyzed. 4. In one of the plants visited, the delegates were shown new types of equipment. 5. Having taken everything into consideration, he decided not to go there. 6. The conference being over, the scientist decided to organize a discussion. 7. They must have this tool adjusted. 8. The temperature being raised, the kinetic energy is increased. 9. The alternating current used for power and lighting purposes is assumed to go through 50 cycles in one second. 10. Accepted atomic theory states that all matter is electrical in structure.11. Talking to your contractors, pay attention to their promises. 12. People attending the production site have to put on the breathing mask.

VI. Insert the appropriate form of the Participle:

1. The mining method (to use) depends on many factors. 2. The problems (to discuss) are connected with the investigations of power supply systems. 3. In all the mines (to visit) automated computerized control systems were used. 4. When (to need) the additional experiments are carried out. 5. Rubber (to cover) with cotton, or rubber alone is the insulating material usually (to use) to cover desk lamp cords and radio cords. 6. (to make) a lot of experiments scientists proved that the current flowing along wires consists of moving electrons. 7. The work (begin) by him was very important. 8. (to refuse) to accept the invitation he left the office. 9. He asked questions without (to look) at us. 10. The engineer looked (to worry).

VII. Translate into English.

Обсужденный вопрос, обсуждая вопрос, обсудив вопрос, написанный отчет, написав отчет, построенный завод, построив завод, строя завод, получив новые данные, полученные данные, слушая лекцию, прослушав лекцию, отправив письмо, собрав информацию, собранная информация, собирая информацию, выполнив работу, выполняя работу, поговорив с ним, обговоренный вопрос, читая книгу, прочитав книгу.

VIII. Translate into English using Participle.

1. Промышленные роботы, спроектированные для выполнения задач в условиях, опасных для человека, широко используются в горном производстве. 2. Не закончив работу вовремя, шахтеры не получили премию. 3.Трансформатор - это устройство, изменяющее напряжение электрического тока. 4. Прибыв в город, приглашенные специалисты отправились на шахту. 5. Приходя в офис, он всегда просматривает почту. 6. Написанная нашим технологом статья была отправлена в научный журнал. 7. Я никогда не слышал об ученом, разработавшем этот новый метод. 8. Интервью, взятое у начальника шахты, было опубликовано в интернете. 9. Мы хотели бы посмотреть устройство, разработанное этим молодым изобретателем.

10. Мощные генераторы, использующееся в настоящее время, работают по тому же принципу, что и генераторы, изобретенные великим английским ученым Фарадеем в 1831.

IX. Role-play the interview:

Student A: You are a safety technician in a diamond mine. Your task is to acquaint the miners with safety procedures. Tell them about possible accidents in mines.
Student B: You are a miner. You should ask the safety technician all possible questions concerning mining accidents. Think about the details.

X. Make a report on mining accidents using Power Point or similar software.

UNIT 3. JOB OF ELECTRICAL ENGINEER

I. Read and translate the text. Write five Wh - questions to the text.

Mining is an incredibly diverse sector with more than 120 occupations ranging from skilled workers to highly qualified professionals. There are many different types of jobs associated with mining and they all have different requirements.

The mining profession has been around for millennia, as coal, gems, metals, and other materials have been in great demand throughout human history. The products that come from mining are used for a wide variety of industry: from coal burned as energy to copper used for wiring, cookware and diamonds for jewellery.

Electrical engineering is the widest field of engineering, concerned with systems and devices that use electric power and signals. It deals with the generation, transmission and distribution of electricity as well as the design of a range of related devices. These include current transformers, electric generators, electrical drives, high voltage engineering, power electronics, control systems, computer design.

Electrical engineers conduct research; design, develop and test electronic systems and the manufacture of electrical equipment and de-

vices (electric motors; lighting and wiring; radar and navigation systems; communication systems; power generation, control and transmission devices). Electrical engineers also design the electrical systems of automobiles and aircraft. They traditionally have focused on the generation and supply of power, so they specialize in areas such as power systems engineering or electrical equipment manufacturing.

Today most engineering work involves the use of computers and computer-aided design programs when designing electrical systems. Besides, electrical engineers should know design techniques, tools and principles involved in production of precision technical plans, drawings and models. The most important technical skills for electrical engineers are reflected in university programs enhancing computer literacy, concepts that relate to electrical engineering, knowledge of machines, including their designs, uses, repair and maintenance and so on.

Many senior engineers supervise a team of workers and engineers and for this reason management skills are significant too. Most engineering projects involve some form of documentation and written communication skills are therefore very valuable. The workplaces of electrical engineers are just as varied as the types of work they do. Electrical engineers can apply their knowledge at plants and factories, the offices of different companies or on sites of mines.

Vocabulary

requirement – требование
concerned with– занятый ч-л, связанный с ч-л
electrical drive – электрический привод
high voltage engineering– техника высоких напряжений
highly qualified professionals – высококвалифицированные специалисты
power electronics– электроника больших мощностей
deal with – иметь дело с
circuit– цепь, схема
processing of information – обработка информации
power transmission – передача электрической энергии
automated manufacturing – автоматизированное производство
conduct research– проводить исследование
electrical equipment – электрическое оборудование

wiring – электрическая проводка
computer-aided design programs – автоматизированное проектирование
design technique – методика проектирования
tools - инструменты
computer literacy – компьютерная грамотность
maintenance – техническое обслуживание
adjusting – настройка, установка
supervise – контролировать наблюдать

II. Match the left and the right.

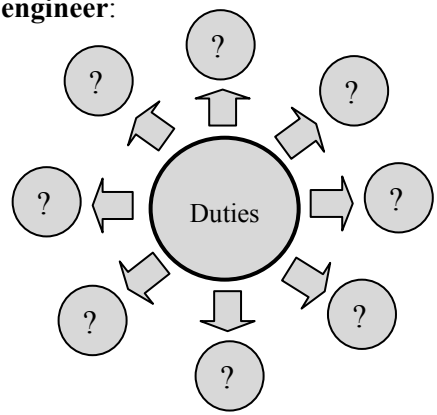
processing of information	техническое обслуживание
computer-aided design programs	электрическое оборудование
maintenance	обработка информации
design technique	передача электрической энергии
High voltage engineering	проводить исследование
conduct research	методика проектирования
automated manufacturing	электроника больших мощностей
power electronics	электрический привод
power transmission	автоматизированное проектирование
electrical equipment	автоматизированное производство
electrical drive	техника высоких напряжений

III. Answer the following questions.

1. What mining professions do you know?
2. What does the job of electrical engineer concern?
3. What kinds of electrical equipment and devices do electrical engineers design and develop?
4. What areas do electrical engineers specialize in?
5. What sciences are fundamental to the discipline (electrical engineering)? Why?
6. What technical skills are important for electrical engineers?

7. What problems does electrical engineering deal with?
8. What devices does electrical engineering design?

IV. Fill in the following scheme with the words related to the duties of electrical engineer:



V. Insert the missing words and word combinations. Use the words from the box:

Distributing, design, communication, central processing units, automated, devices, branches

Electrical engineering can be divided into four main_____:

1. Electric power and Machinery.

Engineers working in this field _____and operate systems for generating, transmitting and _____electric power.

2. Electronic engineering.

This field of engineering deals with the research, design and application of circuits and _____used in the transmission and processing of information.

3. Communications and Control.

Engineers in this field work on control systems and _____systems that are used in power transmission and distribution, in _____manufacturing and robotics.

4. Computer engineering.

Computer engineers design and manufacture memory systems, _____and peripheral devices.

VI. Discuss the following:

1. What University do you study at? What do you know about your University?
2. What faculty do you belong to? When was it founded?
3. What qualifications will you get after graduation?
4. What subjects does the academic program consist of?
5. Which subjects are among your favorite ones at university?
6 .When did you start to think about your future profession? Who helped you to make your choice?
7. Why is the profession of an electric engineer important?
8. What are you going to do after your graduation? What job would you like to have?
9. What are the career prospects of an electric engineer?
10. Where can electrical engineers work?

VII. Find 9 words from the unit:

H	**I**	**S**	**B**	**E**	**R**	**G**	**E**	**L**	**E**	**C**	**T**	**R**	**I**	**C**	**V**
O	**W**	**H**	**I**	**M**	**A**	**I**	**N**	**T**	**E**	**N**	**A**	**N**	**C**	**E**	**O**
D	**I**	**O**	**B**	**A**	**L**	**K**	**G**	**A**	**D**	**A**	**J**	**E**	**A**	**K**	**L**
P	**R**	**O**	**C**	**E**	**S**	**S**	**I**	**N**	**G**	**O**	**S**	**H**	**R**	**A**	**T**
L	**I**	**D**	**E**	**S**	**I**	**G**	**N**	**A**	**E**	**L**	**O**	**O**	**K**	**R**	**A**
O	**N**	**A**	**V**	**I**	**R**	**A**	**E**	**S**	**H**	**M**	**I**	**N**	**I**	**N**	**G**
A	**G**	**E**	**A**	**R**	**T**	**D**	**E**	**L**	**U**	**S**	**N**	**A**	**B**	**E**	**E**
T	**R**	**A**	**N**	**S**	**I**	**P**	**R**	**O**	**F**	**E**	**S**	**S**	**I**	**O**	**N**

VIII. Read the CV. Complete a-j with appropriate headings or categories.

Marital status, employment history, permanent address, educational background, skills, main strengths, hobbies and interests, full name, date of birth, languages.

CURRICULUM VITAE

Alex Smirnov
a) _____
b) _____ 15/03/80
c) _____: Saint-Petersburg, 52, Sadovaya st.
Mobile: +7 (812) 07895782
d) _____ Single
e) _____
1998- 2003 - Saint-Petersburg Mining University
Specialization: Automation and power supply of mines
f) _____
Word-processing; Excel; PowerPoint; Autocad
g) _____
Russian - native. English - Intermediate.
h) _____
September 2004 - present
"PMP Engineering company" LLC
January 2002- September 2003
Italian restaurant: part-time server.
i) _____
Football. Playing the piano. Member of Chamber orchestra. Travelling.
j) _____
Responsible, sociable, hard-working.

IX. These are headings and categories commonly used in CVs.

Marital status, referees, employment history, permanent address, educational background, skills, title, personal details, hobbies and interests, full name, qualifications, date of birth.

Which one means:

a) basic facts about you? ……
b) practical abilities? ……
c) where you live most of the time? ……...
d) what you do in your free time? …….
e) Mr, Mrs, Ms, or Dr? ……
f) when you were born? ……
g) details about your working experience? ……
h) if you are married or single? ……
i) people who can tell us about your qualities and character? ……..
j) proof that you have successfully completed a course? …….
k) schools and college? …….
l) name and surname? …….

X. Study the list of things which are important in a job. Choose the three which are most and least important for you.

- opportunities for promotion
- comfortable working conditions
- status and respect
- interesting and satisfying work
- fringe benefits (e. g. company car, private health insurance)
- a good salary
- extended holidays
- colleagues I like
- a fair and reasonable boss
- training opportunities
- job security

XI. Write your own CV.

XII. Tell about yourself as if you are being interviewed.

1. What are your strengths?
2. What weaknesses do you have?

3. What are your short term goals?
4. What are your long term goals?
5. If you could change one thing about your personality, what would it be?
6. What does success mean to you?
7. What does failure mean to you?
8. Do you manage your time well?
9. How do you handle changes?
10. How do you make important decisions?
11. Do you work well under pressure?

XIII. Translate the following sentences into Russian paying attention to the use of the Infinitive:

1. One of the duties of an electric engineer is to conduct research; design, develop and test electronic systems and the manufacture of electrical equipment and devices.
2. He has a desire to be appointed the safety technician.
3. Electricians use equipment to test the connections and to make sure the components are compatible and safe.
4. To work in underground mines is dangerous.
5. When electrical energy is required to be transmitted over long distances, it can be more economical to transmit it using direct current.
6. It is often cheaper to import some portion of the variable load than to generate it locally.
7. The great heat made the engineer utilize other working conditions.
8. The professor wants the students to carry out some experiments.
9. The laboratory assistant expects the devices to have been repaired some days ago.
10. We know him to have worked out a new method of applying quantum generators.
11. We know this scientist to have been working at this problem for some years.
12. They wondered how to find jobs in mining industry.
13. The engineers seem to be pretty busy with their task.
14. Safety standards or codes are intended to limit or eliminate risks.

XIV. Translate the following sentences into English using the Infinitive:

1. Мы очень счастливы, что нас пригласили на открытие компании.
2. Чтобы изучить работу этого устройства, вы должны собрать много данных.
3. Кажется, что этот метод достаточно точен.
4. Процесс, который рассматривается в этой статье, известен как изотермический.
5. Полагают, что первая вычислительная машина была изобретена в 1812 году.
6. Вероятно, новое устройство будет скоро протестировано.
7. Чтобы получить надежные данные, вы должны провести несколько экспериментов.
8. Инженеру было поручено спроектировать устройство, которое будет регулировать температуру в лаборатории.
9. Я хочу, чтобы меня проинформировали об этом.
10. Они надеются, что их пригласят на конференцию.

XV. Discuss advantages and disadvantages of the profession of electrical engineer working in mining. You can use the following table and add your own items:

Advantages	**Disadvantages**
High salary	Dangers
Good pension scheme	Impact on health
Social guarantees	Hard conditions of work
Demand for specialists	Heavy schedule

XVI. Prepare a presentation or make a report about your future profession. Follow the plan.

1. Professional scope. 2. Educational requirements. 3. Typical tasks. 4. Job characteristics. 5. Personal qualities required for the job. 6. Career possibilities.

UNIT 4. POWER SUPPLY OF MINES

I. Read and translate the text. Entitle the text.

The application of electricity to the mining industry is a distinctive area of both mining engineering and electrical engineering. The difficult environment, the dynamic power loads, the cyclic and mobile operation and stringent safety requirements that characterize mining, all place unique demands on the mine power system. Mining equipment is usually mobile and self-propelled; most is powered electrically through portable cables and, for safety, must be part of an elaborate grounding system. The machines and power-distribution equipment are seldom stationary, must be adapted to continuous cyclic operation, and must resist daunting levels of dust and vibration.

Electricity was first introduced into coal mines shortly before the beginning of the 20th century in the form of direct current (dc) for rail haulage. This form of current was used because at that time most systems were powered by dc generators. It had a number of advantages for haulage; the most outstanding was that the dc series-wound motor had (and has) excellent traction characteristics. Speed control was a simple matter of placing a resistance in series with the motor armature or field circuits. Batteries served as the first power source, and hence the vehicle was extremely mobile even though constrained on rails. The first electrically driven coal mining machine, the coal cutter, was installed in the early 1920's. The next significant increase in power consumption came with the introduction of the battery powered shuttle car in 1937. At that time, the horsepower required to operate each piece of electrical mining equipment was quite small and no individual machine used a large amount of current. However, when all machines were combined, significant power was required, and because all the conductors offered resistance, voltage drops and transmission losses in the distribution system were extensive. In the 1930's, mercury-arc-ignition rectifiers began to be employed to provide dc underground. Through the use of rectifiers, the benefits of dc for traction and of ac for distribution and utilization on high power loads could be realized.

The evolution of mine systems has resulted in major items of power apparatus, each serving a specific function. In general, they can be listed as: generation, main substations, portable and unit substations, switchhouses, distribution transformers and power (or load) centers, and distribution (conductors and connectors).

A main (primary) substation is required to transform the incoming levels down to a primary distribution voltage for the mine. In addition to having the transformer, substations contain a complex of switches, protection apparatus, and grounding devices, all having a function in safety. Switchhouses are portable equipment protecting the distribution circuits. Their internal components are chiefly protection devices with circuit deenergization performed by disconnect switches and circuit breakers. Power centers and distribution transformers transform and convert the distribution voltage to utilization levels. Included here are ac to dc conversion equipment or rectifiers, which convert the distribution voltage to dc for use on rail trolley and other systems. Distribution equipment is often referred to all the overhead power lines, cables, cable couplers, and trolley lines used to carry power and grounding between the power equipment and eventually to the loads.

Electrical equipment installed in mines is especially designed and tested to ensure safety from explosion due to arcing contacts or high surface temperature equipment. The plugs and sockets used below ground should be of the n strained or bolted type. Heat producing elements such as motor winding, electrical heaters, including heat tracing and lighting fixtures are often designed to limit their maximum temperature below the autoignition temperature of the material involved. Both external and internal temperatures are taken into consideration. Safety equipment comprises signaling and communication systems, environmental monitoring systems, gas detectors and electric safety lamps. Such equipment may be needed to facilitate safety operations and can remain energized.

At every mine, electrical equipment is installed below ground and is supplied from a power source at the surface of the mine, switchgear shall be provided at the surface for cutting off the supply of current to that equipment, and adequate provision shall be made for the operation of that switchgear. For the purposes of enabling injury to be prevented, adequate working space, adequate means of access, and adequate lighting

shall be provided at all electrical equipment on which or near which work is being done in circumstances which may give rise to danger.

Engineering and maintaining such an electrical system is demanding and challenging. It requires a specialist with knowledge of both mining and electrical engineering.

Vocabulary

self-propelled equipment – оборудование автономным приводом
portable cable – гибкий кабель
grounding system – система заземления
cyclic operation – работа в цикличеком режиме
resist - сопротивляться
rail haulage – рельсовая откатка
dc series-wound motor – сериесный двигатель постоянного тока
traction characteristic – тяговая характеристика
motor armature – ротор электродвигателя
field circuit – цепь возбуждения
power consumption – потребление энергии
battery powered – питаемый от аккумулятора
shuttle car – самоходная вагонетка
voltage drop – падение напряжения
transmission loss – потери при передачи
ignition rectifiers – игнитронный выпрямитель
main substation – центральная подстанция
switchhouse – здание распределительного устройства
protection apparatus – защитное утройство
circuit breaker – размыкатель цепи
overhead power line – воздушная линия электропередачи
arcing contact – дугогасительный контакт
plug - штепсельная вилка
socket – розетка, патрон
motor winding – обмотка двигателя
electrical heater – электрический обогреватель
lighting fixture – осветительная арматура
autoignition temperature – точка самовозгорания
switchgear – коммутационная аппаратура

II. Answer the following questions.

1. When and where was the first electricity in mining industry used?
2. What do you know about the history of application of electricity in mines?
3. What kind of electric equipment is used in underground mines?
4. What are the functions of electrical mining equipment?
5. Why should the electric equipment of mines be especially designed?
6. What types of plugs and sockets must be used below the ground?
7. What heat producing elements found in mines do you know?
8. What measures should be taken before the installation of the electrical equipment in underground mines?

III. Match the left and the right.

self-propelled	system
portable	haulage
grounding	motor
cyclic	consumption
rail	equipment
dc series-wound	fixture
traction	operation
motor	contact
field	powered
power	characteristic
battery	drop
shuttle	rectifier
voltage	apparatus
transmission	breaker
ignition	armature
main	power line
protection	winding
circuit	temperature
overhead	loss
arcing	circuit
motor	car

electrical lighting autoignition	substation cable heater

IV. Complete the sentences with the missing words.

explosions, lighting, rechargeable, introduced, personal, carbide, hazards, safety, output, mining, illumination, electric

Adequate _____ is crucial in underground mine safety because miners depend most heavily on visual cues to detect _____ associated with falls of ground, moving machinery, and other threats. For as long as underground mining has been performed, illumination has been critical to both _____ and to the ability of the miners to perform their work. Open flames were used from the earliest days of _____.

The Greeks and Romans used oil lamps, and candles were _____ in about the 1st century AD. In about the 16th century, oil wick lamps became common and were used in some mines even until the 1920's.

_____ lamps were developed in the 19th century and were used well into the 20th century. The first attempts to make a safety lamp that would not cause _____ in mines began around the turn of the 19th century. _____ lighting became feasible in the first half of the 20th century. In 1914, two engineers John Ryan and George Deike began to work with Thomas Edison to develop _____ electric lamps. By this time, more efficient tungsten filaments had replaced the older carbon filaments, drastically improving light _____ from the bulbs, and Edison was able to design a small-scale, _____ battery that could be carried on a miner's belt.

Today, the new _____ technology is the light emitting diode (LED) and it is poised to revolutionize mine illumination. White LEDs achieve about 110 lm/W., they are robust because they do not have a glass envelope or filament that can break, and they can _____ useful light in excess of 50,000 hours of operation.

V. Check your knowledge.

1. What is the transformer used for?
2. What elements does a circuit consist of?
3. What is the function of the conductor?
4. What is the resistor used for?
5. What is the function of insulators?
6. What types of current do you know?
7. By what means is a greater output voltage produced?

VI. Choose one of the listed topics and make the presentation in group.

1. Electric circuit.
2. Resistors.
3. Conductors and insulators.
4. Transformers.
5. Amplifiers.
6. Electric lines.
7. Electric motors applied in mines.

VII. Translate the sentences paying attention to the Gerund.

1. We know of Newton's having developed principles of mechanics. 2. Mankind is interested in atomic energy being used only for peaceful purposes. 3. There is no hope of our getting a complete analysis of the measurements within 10 days. 4. They objected to our using greater voltage in this case. 5. We know of the work being carried out in his laboratory. 6. They couldn't help seeing the importance of the process. 7. The semiconductor devices are applied for transmission of signals, for automatic control of a variety of processes, for switching on engines, for the reproduction of sound, protection of high-voltage transmission lines, speeding up of some chemical reactions, and so on. 8. The company considered using modern mining equipment to increase the output. 9. The progress in mining industry was achieved by mechanizing and re-equipping of underground operations.

VIII. Use the verb in brackets as a Gerund.

1. The transformer needs (to repair).
2. Excuse me for (to read) the documents without your permission.
3. They are very glad (to get) such a good job.
4. (to return) home after a long business trip is always pleasant.
5. Our engineer was surprised at the workers (to finish) the task so quickly.
6. I think this problem is worth (to discuss).
7. He is looking forward to (to get) a new position.
8. Do you mind (change) the topic of our discussion?
9. After (to discuss) the problem they touched upon some very interesting items.
10. We enjoy (to look through) your catalogues of mining equipment.

IX. Translate into English, using the Gerund.

1. Извините, что я задаю вам столько много вопросов.
2. Перед уходом из дома выключи все электрические приборы.
3. Мы слышали, как они разговаривали.
4. Мы считаем его большим специалистом в этой области
5. Благодарю вас, что вы помогли мне.
6. Вы не возражаете, если мы протестируем это устройство?
7. Вы помните, что вас просили написать доклад?
8. Они заняты: обсуждают план работы.
9. Это производственное помещение стоит посетить.

X. Imagine that you are a journalist. Find information about modern power supply equipment used in mines and write an article about them.

XI. Put the verbs in brackets in the correct form.

1. Heat losses should (reduce) constantly and effectively.
2. Development of nuclear power plants for civil use (begin) in the mid 1950.

3. Electric charges (act) upon by forces when they move in the magnetic field.
4. A current which does not change its polarity (call) a direct current.
4. Electrically safe locations are those where conditions causing extremely high danger of electric shock (not exist).
7. Wires (use) to deliver electric power and to interconnect different components of electrical installations.
8. The most common power sources (to be) electric generators and primary cells.
9. Electric power (deliver) from power sources to loads by electric wires.
10. Many modern automation systems (to derive) from mechanical systems.
11. The technology of automation (to evolve) from mechanization.

UNIT 5. AUTOMATION OF MINES

I. Read and translate the text. Fill in the table.

Automation or automatic control is the use of various control systems operating equipment such as machinery, processes in factories and applications with minimal or reduced human intervention. The biggest benefit of automation is that it saves labour, however, it is also used to save energy and materials and to improve quality, accuracy and precision.

The term automation was not widely used before 1947, when General Motors established the automation department. It was during this time that industry was rapidly adopting feedback controllers, which were introduced in the 1930s. Automation has been achieved by various means including mechanical, hydraulic, pneumatic, electrical, electronics and computers, usually in combination.

The development of smart technologies that enable remote automation and robotics to be available for mining applications is central to driving productivity and efficiency gain. In the beginning, an individual computer would perform a sequential task or series of tasks; this progressed to the development of parallel processing which enables a synchronized, coordinated computing platform such as connection to network. Parallel processing is much faster than sequential processing, with

large-scale multithreading capabilities allowing for simple repetitive calculations on vast amounts of similar data. Multi-agent systems are composed of autonomous software entities and display increasing complexity; they have the ability to simulate a system or to solve problems and to allow for invaluable integration of technologies in a mining environment.

The development of mining machinery displaying artificial intelligence is the ultimate goal. Intelligent systems integrated into machinery that can adapt to environmental conditions, evolve to overcome challenges and self-heal to prevent downtime are being actively developed. Equipment that can interact with its environment and adapt appropriately to increase productivity and sustainability in mining will be a valuable resource.

The introduction of automation to mining operations can help improve the quality of the work environment for employees by reducing their exposure to potentially dangerous situations. Recent advances in automated control equipment and robotics are expected to result in major improvements in the efficiency and safety of mine machinery. “Smart Devices” for automation generally consist of an embedded processor, sensors, logic and communications parameters. These devices provide improved control capabilities and can provide significantly more information on the operation and health of system components and the condition of the automation process. Water is usually the underground miner's enemy. It must be constantly pumped out. The aqueous environment allows robominers to use buoyancy to efficiently ferry ore both horizontally and vertically. A long tube that connects the mining robot to processing facilities on the surface would also eliminate the need to break bulk between the ore carried by a Load-Haul-Dump vehicle on a deep underground horizontal trimming plane and the ore carried in a vertical elevator to the surface.

A mining environment is an amalgamation of a set of related processes from drilling, blasting and transporting material through to crushing, grinding and to processing and transportation of production output. Incorporation of remote automation involves the use of sensors that are able to provide data required to control mining and processing operations. Advances in data processing technologies have met the requirement created by these sensors to analyze individual signals and integrate information from different sensors. Intelligent software develop-

ment allows computers to autonomously, or at least semi-autonomously interpret the data in ways that can alter parameters of machinery during the mining operation. Intelligent parameters for the mining industry often includes features such as embedded diagnostics, communications, calibrations and control activities typically performed in a programmable logic controller or other distributed control system. Underground mines lack the benefit of global geo-positioning systems. Their dimensions may be changing as walls are being excavated, ceilings crumble, and heavy vehicles are constantly bumping into things. It is nice to have a navigation system that can work off ambient light and is independent of long light cords on ceilings or sensors implanted in walls. “Infrastructure-less Guidance System” in which a vehicle “learns” its route is navigated by the teleoperator. It uses a combination of dead reckoning and a limited artificial intelligence capability to memorize the length of various routes and the characteristics of intersections. An algorithm keeps it centered in corridors. The concept of associating functional system elements with an intelligent agent, provides the basis for excellent system operation, and performance even when unexpected component failure, environmental changes, workload changes, or altered system operating objectives occur. The automation of increasingly complex, critical coupled systems can place a significant demand on centralized automation systems. Intelligent agents can be used to identify faults and then to collaborate and implement a loss mitigation and recovery strategy or a set -healing process. Full functionality can be restored by intelligent agents when the faulty element is repaired, therefore reducing costly downtime and increasing productivity of a mine.

Automated mining equipment	Function	Advantages

Vocabulary

alternating current - переменный ток
amalgamation - смешение, объединение
arcing contacts - дугогасительные контакты
artificial intelligence - искусственный интеллект
automation system - автоматизированная система
battery charging - зарядка аккумулятора
buoyancy -плавучесть; способность держаться на поверхности воды
circuit - цепь, схема
cut off- отключать
distributed control system - распределенная система управления
embedded diagnostics - встроенные функции диагностики
ensure - обеспечивать, страховать
facilitate - способствовать
feedback controllers - автоматический регулятор
fuse - предохранитель
heat tracing - подогрев
identify faults - распознавать поломки
implement - осуществлять
increase - увеличивать
increase fixtures - осветительная арматура
measure - измерять
motor winding - обмотка двигателя
multithreading - многопоточность
parallel processing - параллельная обработка
plug- штепсель, вилка
resistance- сопротивление
semi-autonomously - полуавтономный
sequential processing - последовательная обработка
smart technology интеллектуальная технология
socket - розетка, патрон
software agent - программный агент
supply of current - подача тока
switchgear - распределительное устройство

II. Match the left and the right and fill in the gaps with the missing word combinations from the table.

alternating	system

arcing	off
artificial	control system
battery	controllers
embedded	faults
heat	winding
increase	technology
measure	agent
parallel	current
automation	processing
cut	contacts
distributed	intelligence
feedback	charging
sequential	diagnostics
smart	processing
supply of	tracing
software	fixtures
motor	resistance
identify	current

1. The heating resistor is self-regulating so that a continuous _____ is not needed. (подача тока) 2. The temperature of the _____is monitored. (обмотка возбуждения) 3. Circuit breakers and _____ both serve the same general purpose: they both create a buffer between current and vulnerable components. (дугогасительные контакты) 4. _____ is an electric current which periodically reverses direction, in contrast to direct current which flows only in one direction. (переменный ток) 5. If the engine does not start and the red light is on, check the _____. (заряд аккумулятора) 6. Follow the instructions in order to _____ in the hydraulic system. (распознать неисправность) 7. In addition to the _____, Version 10 also features the market's first Automated Health Check. (программный агент) 8. Cost efficiencies can be realized by changing the workflow from _____ to linear processing. (параллельная обработка) 9. This _____ brings the benefits of cutting-edge research. (интеллектуальная технология) 10.

_____ and insulation should be installed on all piping connected to the unit to prevent cracking. (подогрев)

III. Read the text once again and answer the following questions.

1. What does the term automation mean?
2. What are the main components of automation process?
3. What is the role of smart technologies in mining operations?
4. What is parallel processing?
5. What multi-agent systems are composed of?
6. Name the capacities of intelligent systems.
7. What is the result of the introduction of automation into mining operations?
8. What are the components of smart devices?
9. What is the function of software agents in mine automation systems?

IV. Insert the missing words.

remote controlled, mining jobs, smart, equipment, sensing technologies, to operate, automation, safety, drills, human, teleoperated robots, driverless, at a computer panel, increase, underground mine, submersible robots.

The technology of robotics for automated mining

"Robotization" can ultimately mean a complete reconceptualization of _____ and operations. The first area involves "robotizing" _____ originally designed for humans in a human-friendly mining environment. The easiest projects have involved the material handling side mining, to include robotizing Load-Haul-Dump vehicles and trucks. The focus has been on using _____ to move ore faster and cheaper through existing operational pipelines using conventional equipment and work concepts.

The second generation involves specifically designing equipment as _____. Here, the development of a new "end effector" (the part of the robot that does the actual work). The third generation involves developing robots that completely redefine work paradigms and operational concepts.

Robots go where no _____ could possibly go and work in ways that humans can only imagine but not imitate. _____ designed for deliberately flooded mines are one good example.

Fully automated robotic mining encapsulates mines with _____ for both production and material identification; precise automatic, _____ equipment; automated movement of vehicles such as trucks, and advanced management systems. Robots offer improved _____, greater productivity and efficiency, and are able to operate in remote, harsh environments. Automated control technology has already been applied to drilling operations, allowing an operator _____ the equipment remotely. This removes the operator from potentially dangerous zones on the drill rig, open cut or _____ and increases overall efficiency of the mining operation.

_____ haulage trucks are being developed for open pit mines. Artificial intelligence - incorporating GPS systems, wireless communication and object avoidance sensors enable these trucks to either drive themselves or be driven by an operator_____ away from the mine site. Computer systems that provide information about the velocity and position of the vehicle can prevent accidents and_____ the lifetime of the machine. New _____ such as GPS, radar and laser systems being incorporated into robotics will have an increasing impact on the safety, predictability, precision and efficiency of mining.

V. Translate the following sentences into Russian paying attention to grammar rules.

1. While passing through the conductor, resistance results in the production of heat. 2. Having been tested under different conditions, the motors were put to use. 3. Semiconductors conduct electricity less efficiently than metals. 4. The energy lost in the capacitor appears in the form of heat being generated in the dielectric. 5. The measures discussed are to be used for determining the faults in the conducting wires. 6. Being a semiconductor, germanium is widely used in the transistors. 7. Modern digital computer has been improved many times since Charles Babbage proposed his “analytical engine” programmed to perform arithmetic and data processing. 8. Equipment that can interact with its environment and

adapt appropriately to increase productivity and sustainability in mining is a valuable resource. 9. Recent advances in automated control equipment and robotics are expected to result in major improvements in the efficiency and safety of mine machinery. 10. Incorporation of remote automation involves the use of sensors that are able to provide data required to control mining and processing operations.

VI. Translate from Russian into English.

Применение автоматизации в шахтах способствует экономии энергии, повышению согласованности работы шахтного оборудования. Использование интеллектуальных сенсорных технологий, таких как смарт-буры или самоходные грузовики увеличивает производительность и стабильность горных работ. Кроме того, такие технологии снижают потребление топлива, уменьшают выброс вредных газов, снижают стоимость горных работ. Использование роботов в шахтах уменьшает вредное влияние горных работ на окружающую среду. Системы контроля окружающей среды анализируют такие параметры как уровень подземных вод, вентиляцию в шахте, изменение температуры. Интеллектуальные устройства позволяют снизить потребление энергии и воды в шахте, которые являются очень ценными ресурсами.

VII. Put the verbs in brackets in the correct form.

1. If they (to use) another method, the results would have been different. 2. If the complete list of tasks had been prepared, the engineer (to do) everything in time. 3. If the load (to increase), the speed would decrease. 4. If one coulomb (to pass) a point in a circuit per second then the current strength is 1 ampere. 5. If those machines (to motorize), production efficiency would be better. 6. If they (to apply) more computerized equipment, manufacturing process would be quicker. 7. When the electrons (to flow) in one direction only, the current is known to be direct current. 8. If he (to know) the specific heat and the weight of the substance, he would have calculated its thermal capacity.

VIII. Translate into English using the conditional sentences I, II and III:

1. Если бы у меня была возможность, я бы поехал в Канаду и посетил бы местные шахты. 2. Будь я на твоем месте, то я бы с радостью поехал работать в Южную Африку в шахте на год. 3. Если бы он поступил в университет пять лет назад, он бы сейчас уже закончил его. 4. Ты бы не чувствовал себя таким уставшим, если бы не работал в ночную смену (to be on the night shift) в шахте вчера. 5. Если бы вы повысили зарплату, то предотвратили бы забастовку. 6. Если бы я был шахтером, я бы соблюдал все правила техники безопасности. 7. Если он решит проблему с билетами, то завтра полетит на международную выставку по горному оборудованию. 8. Если бы он откладывал деньги, то поехал бы в этом году в Канаду. 9. Если у меня будет время, я помогу тебе приготовить доклад об электроснабжении рудников

IX. Put in the missing prepositions.

1. Automated operations are usually performed … machines only. 2. Automatic devices can operate independently … human control. 3. The first step … the development … automation was mechanization. 4. Robots … industry were originally designed to perform simple tasks in environments dangerous … human workers. 5. The feedback principle has been used … centuries. 6. Computers gave rise … the development of numerically controlled machines. 7. Industrial automation is a step … mechanization. 8. Automation has also had an influence … the areas … economy.

X. Read and translate the following interview.

I: Good morning, dear listeners! Today my guest is Tony Shores, the manager of the technical services and business development of the EPIC Automation Company. Hello, Tony.
T: Hello, Mark.
I: So, Tony, tell us about automation trends nowadays.

T: Well, a steadily increasing number of tasks are being automated, in virtually all strata of society. Over the next few years, we will see automated solutions for businesses as diverse as transport, retail, security, healthcare, food services, and even in mining.
I: Oh, I totally agree - automation is the inexorable future. Why is it important to take automation to the mines?
T: Neither machines nor mining sites are being used with a high enough degree of efficiency. Automation is a way to increase safety, predictability and productivity.
I: I see. Tony, what is the way of introducing automation into mining?
T: The path to automated solutions in the mining industry will involve several increasingly complex steps, the first being adding automated functionality to machines. This is where most mining companies are today. The second step involves getting machines to cooperate and work together, increasing efficiency and removing employees from hazardous zones.
I: Yes, that's significant! What is the next step?
T: Further steps involve increased automation and integration of systems. The final step is largely self-sufficient round-the-clock operation of mines, with human presence many miles away.
I: Sounds promising. Tony, what would be the best way to start?
T: A good way to start would be with positioning, and then to begin optimizing the traffic flow. The key to successfully implementing automation is to optimize processes and make them work tighter together. For example, optimizing drilling processes to get better fragmentation after the blast, so as to facilitate loading.
I: Is automation in mining more difficult than in any other sites?
T: Mine sites differ from, for example, manufacturing plants in that they are not controlled environments – and also that they keep expanding. It will take time to design and apply the necessary infrastructure to support fully automated solutions.
I: What are the major benefits of automation?
T: Well, automation allows us to remove people from the underground work environment hazards of dust and other contamination. During automation, the equipment operates at designed optimal levels with less wear and tear. Automated equipment continues to operate between shift

changes and is not affected by blast clearance when the mine is being ventilated and employees are at the surface. The efficiency of automation has the potential to reduce operating costs and mine lower-grade ore, extending the life of our mines.
I: Thank you very much, Tony.

XI. Retell the interview, converting direct speech into indirect speech. Use verbs *ask, wonder, say, reply, notify, agree, tell etc.*

XII. Turn the sentences into reported speech. Use the introductory verbs from the box.

ask	tell	order	explain	wonder
	suggest	want to know	promise	
	agree	complain	deny	refuse

1. Mr. Shores says, “Automation allows us to remove people from hazardous workplace”.
2. “What would be the best way to start?”, the interviewer said.
3. “Robots offer greater productivity and efficiency,” the development manager explained.
4. “Tell me about automation trends,” asked Mark.
5. “The route to automated solutions in the mining industry will involve several really complex steps”, said Tony.
6. “I agree that automation is our future”, says Jeremy.
7. “You should pay more attention to the equipment maintenance”, said the foreman.
8. “Don’t be afraid of new technologies”, said the managing director.
9. “Bring me the remote control immediately”, said the operator.
10. “Let’s go to the operation centre,” said the mechanic.
11. “The sound of the working machine was too loud. I couldn’t work without earplugs any longer,” said the worker.
12. “It wasn’t my fault that the robotic arm failed”, said the operator.
13. “I will never be late again for my night shift,” said my counterpart.
14. “I will not go to the automation courses without my co-workers,” says Alec.

15. “I have seen our new automated equipment recently,” said the manager.
16. “You haven’t installed the software correctly, this is why the equipment is out of order,” said the maintenance operator.

XIII. Translate the sentences into English. Mind the sequence of tenses.

1. Он знал, что начальник примет меры для улучшения уровня безопасности. 2. Макс утверждает, что интересуется автоматизацией горного производства. 3. Я думал, что Саид окончил Санкт-Петербургский горный университет в 2015 году. 4. Пресс служба сообщила, что автоматизация шахты протекает успешно. 5. Напарник сообщил мне, что моя смена будет завтра. 6. Менеджер сказал, что Роман ответственный за технику безопасности с прошлого года. 7. Андрей спросил, где находится пульт. 8. Светлана обещала, что пригласит меня на следующую конференцию по безопасности в шахтах. 9. Эксперты подтверждают, что автоматизация может значительно увеличить производительность шахты. 10. Анна объяснила, что нам требуется внедрение новых технологий. 11. Мы интересуемся, как пригласить эксперта по данному вопросу. 12. Инструктор предупреждал, что нахождение в этой зоне опасно. 13. Бригада технического обслуживания сообщила о непредвиденной поломке и просила приостановить работы.

XIV. Put the verbs in brackets in the correct form. Mind the sequence of tenses and non-finite verb forms.

Ulla Korsman-Kopra, Business Manager of the Automation Systems at Epiroc Underground Rock Excavation division explained how (1) _____ (introduce) the automation technologies in a mine. She warned that converting to automation (2) _____(be) not without its problems. She suggested that, for safety reasons, the operation of automated equipment (3) _____ (*modal verb,* be) separated from other working areas of the mine where the underground miners actively (4)_____ (work).

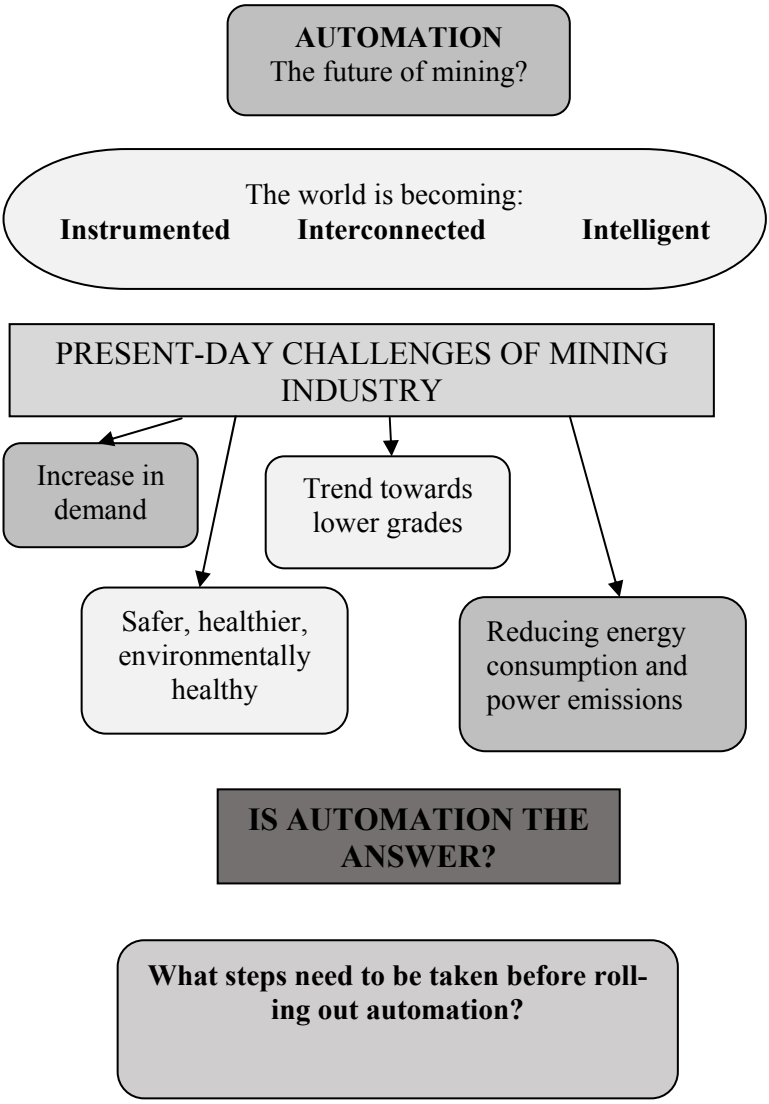
Ulla specified that they didn't intend (5) _____ (transfer) the ore automatically to a haul truck at once. She explained that if they switched to autonomous trucks instantly, they (6) _____ (have to) move through areas where they had active crews working. So they still need (7)_____ (solve) that.

Ulla also mentioned that another downside, they (8) _____ (discover) recently, was not having miners in the drawpoints of the stopes. According to Ulla, miners were still better at (9)_____ (spot) potential hazards in the stopes. As far as we know, a common problem in mining is (10) _____ (estimate) the stability of designed stope in order (11) _____ (reduce) risks.

Ulla specified that the first step in (12) _____ (convert) an existing site was to do a thorough audit. She said that one (13) _____ (*modal verb,* get) a full picture of aspects such as the layout, restrictions, barriers, safety systems, dumping points, traffic flow and personnel. What is more, Ulla noticed that the existing Wi-Fi network certainly needed (14) _____ (enhance). She explained that every automation solution depended on (15) _____ (have) a reliable communication network.

Finally, Ulla pointed out that automated mining technologies (16) _____ (require) the mining industry to consider how efficiency gains (18) _____(change) local mining communities in future.

XV. Describe the picture and answer the questions.



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