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ENGLISH FOR MINERS
(Английский для горных инженеров)

Электронное учебное пособие

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Цель пособия – расширение активного словарного запаса, развитие навыков чтения и перевода, закрепление навыков и умений в профессиональной коммуникации. Тексты составлены на основе аутентичной литературы. Задания к текстам дают возможность организовать дискуссию по обсуждаемой теме, используя при этом лексику текста, стимулируют обучающихся к обмену мнениями, комментированию и высказыванию своего личного отношения относительно полученной информации. Каждый раздел завершается серией упражнений, нацеливающих на диалог и ролевую игру, которая требует использования лексики и информации из текстов.

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Предисловие

Настоящее учебное пособие разработано в соответствии с рабочей программой и предназначено для аудиторной и самостоятельной работы студентов I-II курсов горного направления.

Пособие ставит своей задачей формирование множественных компетенций: общенаучных, профессиональных, языковых и коммуникативных.

Пособие состоит из десяти разделов (Unit): «КузГТУ», «Моя профессия – инженер», «Машиностроение в Кузбассе», «Горное образование в России и в Великобритании», «Выдающиеся ученые в горном деле», «Экологические проблемы Кузбасса», «Угледобыча», «Полезные ископаемые», «Механизация и автоматизация горного дела», «Робототехнологии в горном деле».

Каждый раздел рассчитан на 15 аудиторных часов. К концу курса обучаемые должны овладеть таким объемом профессиональной лексики, который позволит им работать с оригинальной литературой на английском языке и общаться на профессиональные темы без переводчика.

Структура всех разделов (1-10) единообразна: активный словарь, предтекстовые задания, основной текст, послетекстовые задания, задания по развитию навыков устной и письменной речи. Все тексты аутентичны и носят научно-популярный характер, что соответствует современным методическим требованиям, предъявляемым к качеству учебного материала для ВУЗов. Предтекстовые и послетекстовые задания формируют у обучаемых необходимый словарный минимум, который позволит организовать дискуссию по обсуждаемой теме, стимулируют обучающихся к обмену мнениями, комментированию и высказыванию своего личного отношения относительно полученной информации.

Овладение иностранным языком – каждодневный труд. Труд самостоятельный, активный и упорный. Данное пособие предлагает самостоятельное «добывание» знаний, т. к. не только несет учебно-профессиональную информацию, но и организует работу учащихся.

Каждый раздел завершается серией упражнений, формирующих коммуникативную компетенцию, и ролевой игрой, стимулирующей поиск новой информации и необходимость ее обсуждения в связи с расширением знаний о развитии машиностроения в нашем регионе и стране.

Пособие содержит словарь основных терминов и дефиниций.

Оглавление

UNIT 1 KUZSTU

Warming- up

Ex. 1. What is the quotation about? How does it refer to the topic under discussion?

"Of all the wealth that one can accumulate in a lifetime, the most valuable is education. Education that comes through a structured learning system can refine one's thinking, perspective, and vision. Only education helps us separate the wheat from the chaff."

Latin proverb

Lead –in

Ex. 2. What do you know about higher education? Answer the questions.

1. Which features of Russian higher education system do you like and which ones not? Why?
2. What time does the history of higher education in Russia go back to?
3. How many higher education establishments are there in Russia?
4. Has there been any European influence upon Russian system of higher education?
5. Who can enter any higher school?

Ex. 3. a) Give definitions of the following words, if necessary consult English – English dictionary.

- Lecturer –
- Instructor –
- Growth –
- Occupation –
- Accomplishment –
- Construct –
- Administrate –
- Define –

b) Make the sentences of your own with the words from ex. 3. a)

Ex. 4. Find synonyms.

a) assist, extra-mural students, the humanities, build, be made up of, branch, get;

b) unit, construct, obtain, help, correspondence students, be composed of, liberal arts

Ex. 5. Match these types of educational establishments with their definitions.

1. Pre-school educational institutions.	Educational institutions which implement programs for pupils, students with developmental disabilities in training, contribute to their social adaptation and integration into society.
2. Educational institutions.	Educational institutions which implement programs for training and retraining of specialists on the basis of secondary and special education.
3. Institutions of primary professional education.	Educational institutions which implement training programs for skilled workers of the middle management in areas of public benefit activities on the basis of primary and secondary education.
4. Institutions of secondary professional education.	Educational institutions which implement training programs for skilled workers in areas of public benefit activities on the basis of primary and secondary education.
5. Higher educational establishments.	Educational institutions which implement programs of primary and secondary education, as well as secondary education with in-depth study of particular subjects.
6. Correctional institutions.	Educational institutions which implement pre-school programs.

Reading

Ex. 6. Read the text and explain the meaning of the underlined words in your own way.

T.F. Gorbachev Kuzbass State Technical University

At present time T.F. Gorbachev Kuzbass State Technical University is one of the largest higher education institutions of Western Siberia, it

represents by itself the large center of Kemerovo region where fundamental, applied and developmental works are carried out practically for all industries of Kuzbass and Russia.

Training is conducted according to educational programs of higher professional education, including training of specialists on 40, bachelors – 18, masters - 3 programs accordingly. In 2012 it is planned to start in addition 2 educational bachelor programs and 14 master programs. The researches and development in KuzSTU are conducted on as follows: geomechanics; coal chemistry; nanotechnology; geology; exploration and technology of ecologically safe development of deposits and mining; geodesy; land management; ecology; deep coal processing technologies; labor and industrial safety (first of all in mining and chemistry); engineering; modeling of technological and physical processes; economy and management in base branches of Kuzbass.

The university's aim is strengthening and development of human potential of Russia's leading coal region on the basis of consolidation of resources and university possibilities with the key enterprises of the region in educational, scientific-innovative and international activity.

The university's strategic objective is to achieve leader positions on the basis of strengthening of intellectual elite and scientific and pedagogical schools of higher education institution, attract talents for the solution of educational, scientific and production, social and economic problems of Kuzbass.

(http://.kuzstu.ru)

Ex. 7. Discuss these questions with your partner.

1. Does KuzSTU train fully-fledged specialists?
2. Is entry into the University competitive?
3. How are applicants admitted?
4. What subject catalogue does the University offer to its students?

5. Are all subjects compulsory?

6. What's done for those who want to combine work with study?

7. In how many fields of knowledge does the University award Bachelor's degrees /Master's degrees /diplomas?

8. How is research work conducted at the University?

9. Where can the University teachers and post-graduates publish their papers?

Ex. 8. Fill in the gaps.

1. Duration of training for Bachelor degree is … years, for specialist degree - … years and for magistracy - … years accordingly.

2. Upon graduation of the main education there is a chance to continue education in …. and … study.

3. Training in postgraduate … is carried out on 19, in doctoral study on … scientific specialties accordingly.

4. The university's aim is … and development of human potential of Russia's leading … region on the basis of consolidation of resources and university possibilities with the key …. of the region in educational, scientific-innovative and international activity.

5. At present time T. F. Gorbachev … Technical University is one of the largest higher education institutions of Western Siberia, represents by itself the large center … region where fundamental, applied and … works are carried out practically for all industries of Kuzbass and Russia.

6. In 2012 it is planned to start in addition … educational bachelor programs and 14 … programs.

Ex. 9. Read the text and make the appropriate order of the paragraphs. Argue your choice.

History of T. F. Gorbachev Kuzbass State Technical University

A) There are 8 institutes (Mining Institute, Institute of Management, Institute of Chemical and Oil and Gas Technologies, Electricity Engineering Institute, Ecological and Industrial Safety Institute, Institute of Additional Professional Safety, Institute of Mechanical Engineering and Information Technology and Transport, Construction

Institute) and 1 department (Department of Fundamental Training) at KuzSTU, where students are trained on many educational streamlines.

B) Kemerovo Mining Institute (KMI) was founded on the basis of Kemerovo Mining and Construction Technical School in August 30, 1950. In July 29, 1965 KMI was transformed into Kuzbass Polytechnical Institute (KuzPI). In November 22, 1993 KuzPI was renamed into Kuzbass State Technical University (KuzSTU). In May 25, 2011 Kuzbass State Technical University is renamed into the T. F. Gorbachev Kuzbass State Technical University.

C) Duration of training for Bachelor degree is 4 years, for specialist degree - 5,5 years and for magistracy - 2 years accordingly. Upon graduation of the main education there is a chance to continue education in postgraduate and doctoral study. Training in postgraduate study is carried out on 19, in doctoral study on 5 scientific specialties accordingly. The system of additional education on the whole profile of the main professional educational programs of higher education institution is developed at the university.

D) The number of regular academic staff, including branches, is 850, including teachers with degrees and ranks - 60 %, professors, doctors of science – 13,1 %. Branches of the university are located in the following cities: Anzhero-Sudzhensk, Belovo, Mezhdurechensk, Novokuznetsk, Prokopyevsk, Tashtagol.

E) There are 14 scientific and educational centers (SEC) at KuzSTU. There are 12 research (RL) and training laboratories (RTL) at KuzSTU. There are 6 small innovative enterprises (SIE) at KuzSTU.

F) More than 40 Russian enterprises and organizations concluded strategic partnership contracts with KuzSTU. Contracts are also signed with foreign organizations and enterprises. Shandong University of Science and Technology (Qingdao, People's Republic of China), Karaganda State Technical University (Karaganda, Kazakhstan), Archeology Institute (Almaty, Kazakhstan), Byelorussian national technical university (Minsk, Byelorussia), Sevastopol National Technical University and APTECHLIMITED (Mumbai, India) etc.

G) KuzSTU comprises 16 educational buildings including headquarters and buildings of the branches. It has scientific and technical library, an educational and practical complex, 3 hostels for students,

geodesic base and ski base, dining room, sanatorium and preventive clinic, printing house.

H) Now over 19000 students, including about 10000 full time students are trained at the university and its branches. During 61 years the university has trained over 77000 specialists which work in all regions of Russia and the CIS countries. It is remarkable that the most part of chief and engineering staff of the enterprises of Kuzbass industry primary branches are KuzSTU graduates.

(http://.kuzstu.ru)

Ex. 10. Discuss these questions with your partner.

1. How many faculties is the University composed of?
2. Could you name them, please?
3. Does the University have branches in other towns of the region?
4. How many departments are there in the University?
5. Has the University got a preparatory department?
6. In how many subject areas of technical and engineering science do students train at the University?
7. What are the functions of the University's Centre of Pre-Higher Education?
8. How many teaching staff members does the KuzSTU employ?
9. How are the members of the teaching staff ranked?
10. Is the academic and pedagogical potential of the University high? Give facts to support your point of view.
11. What's the total number of students involved in all forms of studies?
12. How many students are on full time?
13. What's the student-teacher ratio?
14. Who is the head of the University?
15. How many vice-rectors are there and what are they responsible for?
16. What are the dean's/sub-dean's duties?

Ex. 11. Fill in the chronological table to speak about development of KuzSTU.

Date	Event
1950	
1965	
1993	
2011	
2012	

Writing

Ex. 12. Translate the article from English into Russian and entitle it. See Appendix 2,3 for help.

Canadian mining activity has created many career opportunities across the country both directly in the sector and in industries that support the mining sector. The mining industry currently employs 363,000 Canadians in mineral extraction and in the value-added smelting, fabrication, and manufacturing areas.

Rapid growth in Canada's mining industry in recent years has led to some challenges for the industry in terms of attracting workers. With a 40-percent retirement rate and new deposits being discovered regularly, thousands of additional workers will be needed each year by mining employers to meet anticipated Canadian production targets to the year 2016, creating many new and exciting careers and in the industry.

A career in mining is rewarding, challenging and high paying. Offering a dynamic work environment, state of the art equipment and technology, travel and advancement, mining employment opportunities are worth exploring.

(http://www.acareerinmining.ca/en/employers/index.asp)

Ex. 13. Summarize what is said on *history of KuzSTU.*

Listening

Ex. 14. a) Before listen to a piece of information try to assume any ways which can help you improve your training.

b) Listen to the text and say whether the following statements are true or false.

1. Raymen Best has been working in the system of higher education for 15 years.
2. If a student does right things, he can get top marks.
3. When it comes time to study, you are to switch on TV.
4. The only kind of music you can have at your background is rock music.
5. Your study time is your job.
6. You shouldn't make a list of necessary affairs.
7. The researches tell us that 25 minutes is the best period for studying and then you may have a small break.
8. Your study time isn't your priority.

Ex. 15. Answer these questions.

1. What kind of students has Rayman Best seen?
2. Why does Rayman Best believe that any student can get top marks?
3. What is the first thing helping for studying according to Rayman Best?
4. What are the useful tips Rayman Best is speaking about?
5. Why can you feel yourself better if you study well?
6. Why is it necessary to make a list?
7. How can you maximize your study time?

Speaking

Ex. 16. Make-up a dialogue on the topic "The KuzSTU development strategy". Use these words and expressions.

One of the largest higher education institutions, to comprise educational buildings, enterprises and organizations, to conclude strategic partnership contracts with, research and training laboratories, educational streamlines, the university's strategic objective, scientific and production, social and economic problems.

Ex. 17. Work with a partner and discuss the following.

Do you think it is important for the University?:

- to develop academic mobility of the teaching staff, students and post graduate students;
- to increase project activities through enhanced cooperation with foreign educational and research centers in the field of fundamental and problem-oriented researches on cutting-edge areas of science and technology
- to increase the number of international joint research projects by 35 % by 2017;
- to improve the attractiveness and brand promotion of the University in the international scientific and educational space.

Ex. 18. In pairs discuss the following, give arguments.

1. The calls for the modernization of higher education are not especially new.
2. Russian universities do not feature prominently in global university rankings such as that of Times Higher Education, which are influential in contributing to global perceptions of which universities are 'world-class' and which are not.
3. Russia is participating in the Bologna process of educational comparability and compatibility through adopting an Anglo-American model of higher education, and working together with international researchers, among other reforms.

4. Federal universities are expected to provide effective teaching, and to concentrate research in particular priority areas identified as strategically important for the region.

5. The main challenges that will have to be considered are the low mobility of academic staff, high levels of regional inequality and the organization of the recently-created federal universities.

Ex. 19. Comment on the following, support your argumentations.

The KuzSTU's aim is strengthening and development of human potential of Russia's leading coal region on the basis of consolidation of resources and university possibilities with the key enterprises of the region in educational, scientific-innovative and international activity.

Ex. 20. Debating.

Work in two groups. The first group is from the Russian Ministry of Education and Science. You are developing the pilot project "The Next Step in Reforming Russia's Higher Education: Creating National Research Universities".

Your aim is the creation of a new type of university, emphasized new opportunities for cooperation with American universities on many levels, including student, faculty, and management exchanges.

The second group is from the regional University. And you are hard observers.

Discuss the following:

- The goal of this project is to enhance the quality of Russia's higher education and research, create opportunities for technological advancements, and boost Russia's economic growth.
- A nationwide competition resulted in the selection of twelve universities that received the status of National Research University.
- Each selected university will receive state funding of approximately R 3,5 billion (or approximately USD 110 million) within 5 years, essentially doubling their budgets.
- These universities must secure an additional 20 percent of the amount either from their own funds or local business communities.

- To ensure that the money is not wasted, funding will be delivered in tranches, with new funding dependent on results. Among the key indicators are: the promotion of younger researchers and instructors, development of new technology and new pedagogical methods, publications in internationally recognized journals, and the transfer of university intellectual property to the market.
- The status of national research university can be revoked if a university does not meet established standards.

Glossary

industrial center	промышленный центр
mining	горное дело
to hold classes	проводить занятия
accomplishment	достижение, благоустройство
plot	участок
facilities	возможности, условия, оборудование
assume	принимать, присваивать
extra-mural	заочный
branch	филиал, отделение
teaching stuff	профессорско-преподавательский состав
graduate from	выпускаться
enter	поступать
applicant	абитуриент
educational streamlines	образовательные направления
senior teacher	старший преподаватель
active professional	специалист-производственник
department	факультет
postgraduate study	аспирантура
underground mining technology	технология подземной разработки месторождения
water purification	очистка воды
processing	переработка
utilization	использование
industrial wastes	промышленные отходы
hydromechanization	гидромеханизация
geomechanics	геомеханика

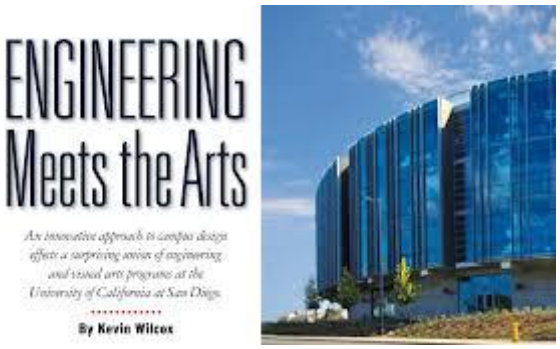
rock condition	состояние породы
open-cast mining	разработка открытым способом
mineral deposits	природные ископаемые
applied mechanics	прикладная механика
fatigue rupture	усталостное разрушение
coating surface	поверхностный слой
degassing	дегазация
coal seam	угольный пласт

Вернуться в оглавление

UNIT 2 MY FUTURE PROFESSION – AN ENGINEER

Warming up

Ex. 1. Think of how can engineering be related to our life? Give examples of your own.



Lead –in

Ex. 2. What is the quotation about? How does it refer to the topic under discussion?

"A good scientist is a person with original ideas. A good engineer is a person who makes a design that works with as few original ideas as possible. There are no prima donnas in engineering."

Freeman Dyson

Ex. 3. Find synonyms to the following words.

Science, technology, research, structure, application, industry, building, background, determine, knowledge, engineer.

Ex. 4. a) Give definitions of the following terms, if necessary consult English – English dictionary.

- Architectural engineering –
- Biomedical engineering –
- Civil engineering –
- Electrical engineering –
- Industrial engineering –
- Software engineering –
- Computer engineering –
- Mechanical engineering –

b) Make the sentences of your own with the words from ex. 4. a)

Ex. 5. What do you know about mining engineering? Answer the questions.

1. Do we need engineering? Why?
2. What is mining engineering?
3. Do engineers use mathematics, physics, and technology?
4. Where can engineers work?
5. Is mining engineering a profession or a mission?

Reading

Ex 6. Read the text and explain the meaning of the underlined words in your own way.

What does a Mining Engineer do?

Mining engineers plan and direct the various engineering aspects of extracting minerals from the earth. They prepare initial plans for the type, size, location and construction of open pit or underground mines.
The sorts of things that a mining engineer oversees at a mine might include:

• conduct investigations of mineral deposits and undertake evaluations in collaboration with geologists, other earth scientists and

economists to determine whether the mineral deposits can be mined profitably;

• prepare plans for mines, including tunnels and shafts for underground operations, and pits and haulage roads for open-cut operations, using computer-aided design packages;

• prepare the layout of the mine development and the way the minerals are to be mined;

• plan and coordinate the employment of mining staff and equipment with regard to efficiency, safety and environmental conditions;

• consult with geologists and other engineers about the design, selection and provision of machines, facilities and systems for mining, as well as infrastructure such as access roads, water and power supplies;

• operate computers to assist with calculations, prepare estimates on the cost of the operation and control expenditure when mines come into production;

• oversee the construction of the mine and the installation of plant and equipment;

• make sure that mining regulations are observed, including the proper use and care of explosives, and the correct ventilation to allow the removal of dust and gases;

• conduct research aimed at improving efficiency and safety in mines;

• establish first aid and emergency services facilities at the mines.

(http://www.ausimm.com.au/content/docs/careers_booklet_miningen)

Ex 7. Discuss these questions with your partner.

1. What does a mining engineer plan and direct?
2. What sorts of things does a mining engineer oversee at a mine?
3. What plans does a mining engineer prepare?
4. What equipment does a mining engineer coordinate?
5. Whom does a mining engineer consult to in his work?
6. What regulations is a mining engineer to observe?

Ex. 8. a) Skim the text and express your point of view about popular types of mining engineering jobs.

Mining Engineering Career Opportunities

Mining engineers have a wide variety of career options including becoming mine planners and designers, consultants for **tunneling operations** (for road, rail, hydro-electric, water supply or **sewerage works**), operations managers, technical specialists (e.g. rock mechanics, **drilling and blasting**, mine machinery or ventilation), investment analysts and advisers, researchers, or general managers and mine managers.

To prepare for such a career, students studying mining engineering cover a broad range of subjects such as mining technology, **rock mechanics**, ventilation, geology, metallurgy, **surveying**, economics and finance, management, health and safety, environmental principles and computer applications.

Mining Engineer - Open Pit

Mining Engineers working in open pits are involved with both long and short term open pit mine planning, mine design **scheduling** and budgeting, strategic planning, supervision of technical and operating staff, mine management. They are also involved with feasibility studies, drilling and blasting supervision, operation of mining systems, evaluation of open pit mining equipment, mining contract development.

Mining Engineer - Underground

Underground Mining Engineers can be involved with coordinating mining activities, maintenance scheduling for all equipment, **short/long term mine planning**, scheduling and design. They supervise staff and are involved with feasibility studies, mining contract development, design operation and maintenance of underground mining equipment.

Mining Engineer - Coal

Coal mines can be open pit or underground and tend to use different mining methods. Coal mines can be prone to gas and fire problems. Coal Mining Engineers can be involved with coordinating mining activities, maintenance scheduling for all equipment, short/long term mine planning, scheduling and design. They supervise staff and are involved with **feasibility studies**, mining contract development, design operation and maintenance of mining equipment.

Mining Engineer - Consulting

Mining Engineers who work as consultants are often involved in a wide variety of projects, mining methods and different technical areas. They use computer programs to model the mining process and design and can work on both open pit and underground developments. Consulting mining engineers will typically be based in coastal cities and fly out to projects and mines as required.

Mining Engineer - Academic/Research

Academic and Research mining engineers often work in universities or CRC's (cooperative research centers). Rather than looking primarily at the economic issues of how to mine most economically and locating the boundaries of **ore deposits** for this reason, academic and research engineers investigate why and how things behave the way they do or are the way they are. They experiment with different mining methods, designs and equipment.

(http://www.ausimm.com.au/content/docs/careers_booklet_miningen)

b) Look at the text again and give Russian equivalents to the underlined word combinations. Consult Appendix 1 if necessary.

Ex. 9. Discuss these questions with your partner.

1. How many types of mining engineers are there?
2. What career options do mining engineers have?
3. What subjects do students study to become a mining engineer?
4. What are mining engineers working in open pits involved with?
5. What do underground mining engineers do?
6. What is a coal mining engineer?
7. What are consulting mining engineers involved with?
8. Who are academic and research mining engineers?

Ex. 10. Insert the words from the list (1-5) in the sentences below.

1) processing 2) information technology 3) mining engineers 4) in demand 5) career progression.

1. Mining Engineering is one of the most interesting careers, offering a good salary and a)..... for both women and men, who can work in technical, management, financial, and government fields.

2. In general, mining engineering is safe, economic recovery, b)..... , marketing and financial management of mineral resources. To undertake these tasks, c)..... should have a broad education that includes many disciplines.

3. These disciplines are geology, civil and mechanical engineering, metallurgy, commerce, economics, management, law and d)..... Knowledge of these disciplines helps with problem solving, team work and leadership.

4. It is the combination of these qualities that distinguishes mining engineers and results in them being versatile and e).....by other business sectors.

Ex. 11. Complete this dialogue with the sentences below.

1. Roles include: production, planning: supervision, contracting, foreman, shift bossing and underground operator.

2. I thought that if I was solid then I could pick anything and be more robust. I could not say that I planned each job – but I have ended up with some great roles.

3. The past decade has been tough in mining – and I am seeing for the first time what it is like to be in boom time.

4. I picked Geological Engineering I was lucky enough to get a women in engineering cadetship from Melbourne Water after 1st year.

5. There is always a win-win solution out there for work issues or your career – the fun bit is finding that solution – it feels good when both parties win.

6. I have started learning Spanish and Six Sigma Improvement Methodology.

- *What is your name? What formal qualifications do you have?*

My name is Kate Sommerville. After RMIT in Melbourne I did a distance mining course at Ballarat. I then concentrated on getting my statutory tickets. After a break I realized that I was unbalanced on the

business side so I did an MBA - Distance through Edinburgh Business School. a)…..

- *Why did you choose your particular career(s)?*

I put all my likes together: earth science, physics, chemistry, maths, outdoors and adventure. I wanted to do something useful: mining was on the radar by year 2011 and in my final year of school we did 'minerals to metals in chemistry' and suddenly from an average student I shot to the top of the class for this subject. I knew it was the industry for me. b) ….

I was very grateful for that experience.

- *What have you done?*

I have 13 years experience and have worked all around Australia and also did some work at mines in South America, North America and South Africa. I have done a mix of residential and FIFO arrangements. I started off in underground mines but have been exposed to many types of commodities and operations. c)…. For the last two years I worked in a Business Improvement role where I was responsible for networking, running workshops and conferences, benchmarking, educating and encourage sharing of technical expertise over all the BHP Billiton sites in the world. Now I am assisting Olympic Dam improve its mining operations.

- *Do you have any regrets about how your career has developed?*

I finally got the dream job so, in spite of everything and doubts at many points it has worked out. My initial approach was to get broad experience in production, planning, corporate and contract. d)…. I have seen some others who have set out to get a solid technical portfolio and ended up in consulting by 30 – I admire their foresight. I have changed companies and sites quite a bit – it can get frustrating changing so much – you have to keep proving yourself each time.

- *What have you enjoyed most about your profession(s)?*

Mining has such a cross section of people and I enjoy seeing different perspectives. People spend years in 'wanderlust' trying to get the people/country experience that you can get in mining. The people are passionate, friendly, encouraging and like me, enjoy a good drop of red wine!

- *What are the negatives and low points in your career?*

On my first day of work – part of the operation was closed down and many people lost their jobs. From this day I have always ensured that I

never commit too much financially – as there is a chance I may lose my job. e)….. Mining is a lifestyle job and my husband is in mining also. It takes quite a bit of juggling to ensure we end up in the same location and roster. It would be good if more mines could accommodate senior professional couples on the same site. I am encouraged to see more women balancing a rewarding career and family at mines – but still think we have a long way to go.

➢ *For someone considering a career in your profession are there any words of wisdom to pass on to them?*

Get site and hands on experience before you do anything else. Get exposure to both production and planning. Work out where and how you want to live and get experience, which suits your end game. Always leave a job in a better state than you found it - work is about giving and receiving. f)….. Keep learning, laughing and be positive.

(http://www.ausimm.com.au/content/docs/careers_booklet_miningen)

Ex. 12. Discuss these questions with your partner.

1. Who is interviewed?
2. What qualifications does she have?
3. Why did she choose this profession?
4. Has she had any experience in mining?
5. What countries has she worked in?
6. Does she have any regrets about her career development?
7. What is the most interesting about mining engineer career?
8. What are the negatives and low points in mining engineer career?
9. What parting words can be said to those who want to choose this career?

Ex. 13. Match the columns to read some interesting facts about engineering.

1. The word engineer	a) in Dubai, UAE. It reaches an incredible 828 meters (2,717 feet) in height.
2. As of 2010, the tallest building in the world is the Burj Khalifa	b) comes from a Latin word meaning ‘cleverness’.
3. The Great Pyramid of Giza is the oldest of	c) the Ancient Wonders of the World and the last one that remains largely intact.

4. The building of the Panama Canal, which links the Atlantic and Pacific Oceans,	d) they help reduce drag, this allows the ball to fly further than a smooth ball would.
5. Golf balls have dimples because	e) was one of the most difficult engineering projects ever. It is estimated that over 25,000 workers lost their lives during the long and dangerous project, with most dying from disease and landslides.
6. As of 2010, the longest suspension bridge in the world is	f) in New York, USA is the longest tunnel in the world (as of 2010). Drilled through solid rock, it reaches a staggering 137 kilometres (85 miles) in length.
7. Used for water distribution, the Delaware Aqueduct	g) the Akashi Kaikyo Bridge in Kobe, Japan. Opened in 1998, it spans an amazing 1991 meters (6,529 feet).
8. The Hoover Dam, built along the	h) China reach speeds of up to 350 kph (220 mph).
9. High speed passenger trains in	i) Colorado River between 1931 and 1936 reaches 726 feet in height (221 meters).
10. The London Eye in England	j) rotor tips that reach over 200 meters (656 feet) above the ground.
11. The tallest wind turbine in the world has	k) is the largest Ferris wheel in Europe, standing at a height of 135 meters (442 feet).

Writing

Ex. 14. Translate the article from English into Russian and entitle it. See Appendix 2,3 for help.

You may be wondering whether you are suited to a career in mining. Choosing a career is an important decision that requires careful consideration. Identifying your interests, specific skill sets, and work preferences are steps in the process. Here are several online self-assessment tools to help you determine whether mining is the right career path for you:

ESPORT (Essential Skills Portfolio) - Developed by Human Resources and Skills Development Canada, this website offers

comprehensive tools to help you further explore your particular "fit" with various careers, including some exciting careers in mining! Identify your capabilities and essential skill sets, as well as careers that would work for you.

Career Development eManual - Developed by The University of Waterloo's Career Services Department, this step-by-step self-assessment tool offers a complete online assessment of your personality, interests, values, skills, learning needs, and self-employment potential.

Working in Canada - Working in Canada is the Government of Canada's leading source for jobs and labour market information. It offers users free occupational and career information such as job opportunities, educational requirements, main duties, wage rates and salaries, current employment trends, and outlooks.

Identify Your Career Options - Developed by the Government of Canada, this website offers career quizzes to help you discover career options that match your interests and abilities, as well as links to other online career resources.

(http://careerplanning.about.com/od/careerchoicechan/tp/Career-Choice)

Ex. 15. Summarize what is said on *advantages of being a mining engineer.*

Listening

Ex. 16. a) Before listen to a presentation try to describe the qualification of an engineer of the future. What skills should he/she possess from your point of view?

b) Listen to a presentation and say in which order is the following done?

- ☐ **A –** economic globalization
- ☐ **B –** students training
- ☐ **C –** engineering education
- ☐ **D –** students international qualification
- ☐ **E –** engineers role in the society

Ex. 17. Watch the video once again and say what is global engineering and what qualities must a global engineer have?

Speaking

Ex. 18. Discuss in pars what is mining engineering, whether it is popular or not in the modern society.

Ex. 19. Discuss the following, give your arguments.

1. Engineering is quite different from science. Scientists try to understand nature. Engineers try to make things that do not exist in nature.
2. Engineers stress invention. To embody an invention the engineer must put his idea in concrete terms, and design something that people can use. That something can be a device, a gadget, a material, a method, a computing program, an innovative experiment, a new solution to a problem, or an improvement on what is existing.
3. Almost all engineers working on new designs find that they do not have all the needed information. Since a design has to be concrete, it must have its geometry, dimensions, and characteristic numbers. Most often, they are limited by insufficient scientific knowledge.
4. Engineering sciences have been born. Thus they study mathematics, physics, chemistry, biology and mechanics. Often they have to add to the sciences relevant to their profession.

Ex. 20. Work in pairs and test your partner how much he/she knows about engineering.

1. Solar power generates electricity from what source?
2. Did the Apple iPhone first become available in 2005, 2006 or 2007?
3. In terms of computing, what does CPU stand for?
4. True or false? Nintendo was founded after the year 1900.
5. The Hubble Space Telescope is named after which American astronomer?
6. Is the wavelength of infrared light too long or short to be seen by humans?
7. Firefox, Opera, Chrome, Safari and Explorer are types of what?

8. True or false? Gold is not a good conductor of electricity?

9. The technologically advanced humanoid robot ASIMO is made by which car company?

10. True or false? Atomic bombs work by atomic fission.

11. In terms of computing, what does ROM stand for?

12. Did the original Sony Playstation use CDs or cartridges to play games?

13. What is the Earth's primary source of energy?

14. IBM is a well known computer and information technology company, what does IBM stand for?

15. Along with whom did Bill Gates found Microsoft?

16. What science fiction writer wrote the three laws of robotics?

17. True or false? In computing, keyboards are used as input devices.

18. What does the abbreviation WWW stand for?

19. Nano, Shuffle, Classic and Touch are variations of what?

20. True or false? DNA is an abbreviation for 'Deoxyribonucleic acid'.

Quiz Answers 1. The Sun 2. 2007 3. Central Processing Unit 4. False - 1889 5. Edwin Hubble 6. Long 7. Web browsers 8. False 9. Honda 10. True 11. Read Only Memory 12. CDs 13. The Sun 14. International Business Machines 15. Paul Allen 16. Isaac Asimov 17. True 18. World Wide Web 19. The Apple iPod 20. True

Ex. 21. Role play.

A: You are going to plan your career as a future mining engineer, present some steps of it. What is necessary to do at first, second and so on? Discuss the CV's steps with your group mates.

B: You have an experience of operating engineer at the local mine. Share your options with the colleagues. Present your CV.

Glossary

drag	торможение, запаздывание
application	применение
insight	проникновение, понимание
cognizance	компетенция; юрисдикция
fluid mechanics	гидроаэромеханика
plumbing	паяльные работы; водопровод
architectural engineering	архитектурное проектирование

biomedical engineering	биоинженерия
civil engineering	гражданское строительство
computer engineering	проектирование компьютеров
electrical engineering	электроинженерия
industrial engineering	промышленное строительство
mechanical engineering	машиностроение
software engineering	разработка программного обеспечения
dam	дамба, плотина
environmental engineering	природообустройство
deforestation	вырубка леса
pollution	загрязнение
acid rain	кислотный дождь
artificial heart	искусственное сердце
wavelength	длина волны
infrared light	ИК излучение
deoxyribonucleic acid	дезоксирибонуклеиновая кислота
dimension	размеры; величина
rotor tip	законцовка лопасти несущего винта
wind turbine	ветряной двигатель
prosthetic limbs	протезные конечности
synthetic organs	синтетические органы
wheelchair	инвалидное кресло
statutory tickets	официальная лицензия
benchmarking	сопоставительный анализ отдельных показателей
wanderlust	"охота к перемене мест"
roster	рабочий график

Вернуться в оглавление

UNIT 3 ENGINEERING IN KUZBASS

Warming up

Ex. 1. What comes to your mind when you look at this picture? How does it refer to the topic?

Lead –in

Ex. 2. What is the quotation about? How does it refer to the topic under discussion?

"The human foot is a masterpiece of engineering and a work of art."

Leonardo da Vinci

Ex. 3. Find synonyms to the following words.

Development, construction, coal, area, production, plant, mine, engineering, equipment, mechanism, enterprise, invention, employ.

Ex. 4. a) Give definitions of the following terms, if necessary consult English – English dictionary.

- Machine building –
- Crusher –
- Excavator Shovel –

- Feeder –
- Loader –
- Press Forging –
- Bottom-Poured Ingot –
- Ingot –
- Crane –

b) Make the sentences of your own with the words from ex. 4. a)

Ex. 5. What do you know about industrial development of your region? Answer the questions.

1. What are the main regional branches of industry?
2. What are the main regional enterprises?
3. When did the region become the leading coke chemical industrial center?
4. Why does Kuzbass play a great role in the economic development of the country?

Reading

Ex. 6. Read the text and explain the meaning of the underlined words in your own way.

Industrial Development of Kemerovo City

A lot of cities have century-long history but 90 years of existence is not a long period. An administrative center of Kuzbass – big industrial and cultural center of our country – appeared instead of Sheglovsk.

Although the location of coal fields near the river Tom was very favorable and didn`t require either many efforts or much funding, it took the Imperial government 200 years to start the extraction of Kuznetsk coal. The construction of the roads was unnecessary as the river Tom allowed to transport coal to the territories by such rivers as the Ob and the Irtish up to the Ural river, where the demand for coal was very high.

There was an increase in the extraction of coal in Kuzbass in 1921. It allowed the region to become the leading coke chemical industrial center within 5 years. In summer of 1921 the initiative group of American

workers headed by a Holland engineer and communist S. Rutgers and an American communist B. Heighwood offered the Soviet government to found a colony of foreign workers and specialists in Kuzbass.

The Soviet government assigned Kuzbass a great role in the economic development of the country. There was only one steel and iron provider in the Soviet Republic at that time – Urals – and Kuzbass was to provide it with coking coal. In the same year, the collieries of Sudzhensk and the KOPIKUZ Corporation's plants and mines were nationalised. At the end of 1922, the Coal Industry Trust of the Kuznetsk Basin was founded and Autonomous Industrial Colony of Kuzbass (AIC) was established. The industrial large-scale construction that started in the Kuznetsk Basin in summer of 1930 soon became a matter of national importance and support.

New mining machinery and mechanisms were introduced in coalmines. Kemerovo Repair and Engineering Works, Anzhero-Sudzhensk Engineering Plant and Kisselevsk Mining Engineering Plant played a great role in providing the new mines with equipment.

By the beginning of World War II, there were 59 operating mines in Kuzbass with a total annual output of over 50 million tons.

Non-ferrous metallurgy appeared in Kuzbass in the last five years before the war. This is when Belovo Zinc Plant and Novokuznetsk Aluminium Plant were built. Besides, there was a significant increase in gold mining.

The third largest industry in Kuzbass, after coal mining and metallurgy, was chemistry. Kuzbass chemical enterprises supplied the country with hundreds of thousands of tons of high quality nitrous fertilisers, sulphuric and nitric acids, sodium hydroxide, pitch, varnish and technical lubricants.

A powerful railway system was built in Kuzbass, which cost to the Soviet government over 500 million roubles. The total length of the railroad reached nearly two thousand kilometres.

(http://www.kemerovo.ru)

Ex. 7. Discuss these questions with your partner.

1. What was the reason for Kuzbass development by the government?
2. Why was the construction of the roads unnecessary?

3. Why did the region become the leading industrial center?
4. What enterprises played a great role in providing the new mines with equipment?
5. What is the largest industry in Kuzbass after coal mining?
6. Why did the Soviet government assign Kuzbass a great role in the economic development of the country?
7. When did non-ferrous metallurgy appear in Kuzbass?
8. How many mines, open-pit mines, coal preparation plants, machine-building factories were there in Kuzbass coal industry by the early 90s?

Ex. 8. Complete the sentences using the words below.

Demand, roads, a colony, coal fields, coal, extraction, transport, summer of 1921, large-scale construction, national importance.

1. The location of … near the river Tom was very favorable and didn`t require either many efforts or much funding, it took the Imperial government 200 years to start the …. of Kuznetsk …..
2. The construction of the … was unnecessary as the river Tom allowed to … coal to the territories along such rivers as the Ob and the Irtish up to the Ural river, where the …. for coal was very high.
3. In … the initiative group of American workers headed by a Holland … and communist S. Rutgers and an American communist B. Heighwood offered the Soviet government to found … of foreign workers and specialists in Kuzbass.
4. The industrial …. that started in the Kuznetsk Basin in the summer of 1930 soon became a matter of …. and support.

Ex. 9. a) Read the text and make the appropriate order of the paragraphs. Argue your choice.

Modern Industrial History of Kemerovo City

A. On the whole, by early '90s the coal industry of Kuzbass comprised 78 mines, 24 **open-pit mines**, 28 coal preparation plants, 5 machine-building factories for coal industry, 7 research institutes and

many auxiliary enterprises. There were 315,000 people employed in this industry. Maximal coal output was achieved in 1988 totaling 159 million tons.

B. Successful start of Kuzbass industry in the post-war period determined its further long-term development. This is especially observed in the coal industry. In 1960 there were eleven mines, seven opencast mines, six **preparation plants**. One of these mines is Raspadskaya mine. Now it is the largest mine in the country.

C. Such big enterprises as Novokuznetsky Ferroalloys, Aluminium Plant, Kuznetsky and Kemerovo Heat and Power Plants were put in operation. Almost two-fold increase in **coal output** achieved by the local miners saved the national economy from fuel shortages. Especially rapid was the growth of chemical industry in the region. Kemerovo turned into the largest chemical center based on processing of coal and **coking gas**.

D. Chemical and electromechanical enterprises were placed in Kemerovo, iron-and-steel works found their new place in Novokuznetsk. In total, by autumn of 1942 over 50 industrial enterprises, 35 organizations and many educational institutions were relocated to Kuzbass.

E. In post-war time the plans were to develop ferrous and non-ferrous metallurgy, building industry and to increase capacities of light and food industries in the Kuznetsky Basin.

F. In the first days of the World War II in the USSR, the Government decides to evacuate enterprises, including inventories and productive assets from the near-front zone to eastern parts of the country. Workers, technicians and engineers of Donbass Coal Trusts came to Kuzbass. Various research institutes were also evacuated here.

(http://www.kemerovo.ru)

b) Look at the text again and give Russian equivalents to the underlined word combinations. Consult Appendix 1 if necessary.

Ex. 10. Fill in the chronological table to speak about development of Kemerovo industry.

Date	Event
1921	
1922	
1926	

1930	
1935	
1941	
1942	
1960	
1988	
1990	

Ex. 11. Before reading the text, tell what you know about Machine Building Plant "YURGA".

Machine Building Plant "YURGA"

Machine Building Plant "YURGA" is a producer of mining equipment, truck-mounted cranes, metallurgical products and multipurpose industrial equipment. It is the center of coal mining engineering in Kuzbass and one of the leading manufacturers of mining equipment in Russia. For 65 years Machine Building Plant "YURGA" has been running as a powerful complex of multibranch production operations from steelmaking to assembly of the most complex items.



Mining Equipment • Roof supports conveyors • Stage loaders • Crushers • Machines • Chain cable handlers • Power hydraulics • Excavator shovels • Hydraulic monitors • Feeders	Load Lifting Machines • Cranes • Loaders • Fork lifts • Hydraulic cart "Jimbo"	Metallurgical Products • Press forgings • Rolled rings • Hammer forgings and closed die forgings • Cast bars • Precision casting • Forging ingots • Bottom-Poured ingots

High technical performance and competitiveness of mining equipment, truck-mounted cranes "YURGA" (earlier “Yurginets”) and other machinery have been more than once awarded medals and certificates at international fairs both in Russia and abroad.

Since 1992 Machine Building Plant “YURGA” as a part of the fuel and energy complex has become a center of Kuzbass coal mining engineering and one of the leading manufacturers of mining equipment in Russia. Since 2006 the plant has launched production of mining equipment on a level with the highest world standards.

(http://eng.yumz.ru/product/mine)

Ex.12. Look through the table of mining equipment in ex. 11 and discuss these questions.

1. What does Machine Building Plant “YURGA produce?
2. Do you know what each type of equipment is used for?
3. Have you ever come across such specifications in Russian or English mining industry trade journals?

Ex.13. Explain the difference between different types of equipment. Use the model.

Model: A conveyor is used in mining industry for coal hauling, and a stage loader is a chain conveyor used in the longwall mining of coal that transports coal cut by a coal shearer from the shearer's armored face conveyor (AFC) to a main belt conveyor.

conveyor	stage loader
crusher	chain cable handler
power hydraulic	excavator shovel
hydraulic monitor	feeder
press forging	rolled ring
cast bar	precision casting

Ex. 14. Match the columns to read some useful facts about energy branch of Kuzbass industry.

Energy Circuit to be Created at South of Kuzbass

The energy circuit	allow to raise stability of power supply in Novokuznetsk and provide failure-free electrical energy deliveries to the metallurgical and coal enterprises situated here, in particular – to the Novokuznetsk Aluminum Plant, Kuznetsk Ferrous Alloy, Novokuznetsk Iron and Steel Works, etc.
The availability of two independent power sources for each substation will	which is planned to be created at the south of Kuzbass by the engineers of MES Siberia, will include substations Elanskaya, NKAZ-2, West-Siberian with the voltage of 220 kV and substations Kuzbasskaya, Novokuznetskaya with the voltage of 500 kV.
MES Siberia is	for Engineering and Construction Management of Siberia and MES of Kuzbass, the heads of contractor organizations, which took part in the setting, approved of the decision of FGC – creating an energy circuit at the south of Kuzbass will provide broader possibilities for the development of local enterprises.
It is noted that the employees of the Center	going to create an energy circuit at the South of Kuzbass. The project is scheduled to be completed for the end of December 2012 – this was announced at the setting of the operational headquarters of the execution of the investment projects of FGC UES Main Electrical Grids of Siberia in Kuzbass by the General Director of the branch.

Ex. 15. Using the information from ex. 14 expand on the crucial role of energy industry in Kuzbass.

Writing

Ex. 16. Translate the article from English into Russian and entitle it. See Appendix 2,3 for help.

Today all over the world there is a steady development of coal processing and creation of new technologies. It must be said, that now only in the republic of South Africa complex coal processing is realized completely. But practically all the countries having coal reserves try to solve this problem. For example, China actively develops water-coal fuel manufacture and plans to extract 12 million tonnes a year.

At the stage of mining re-structuring practical application of ideas of deep coal processing should be undertaken. One of the forms of practical realization of scientific and technical approach in this field was defined by the Siberian branch of the Russian Academy of Sciences to create on the basis of the state unitary enterprise "semicoking Factory" (Leninsk-Kuznetsk) research-and-production deep coal processing association. Such extraordinary association allows connecting in all available capacities and possibilities to approbations, and fasting introduction in manufacture many successful scientific works of the Siberian Branch of the Russian Academy of Science in the field of coal chemistry: manufacture of the activated coals, few-smoke fuel, sorbents, coal briquettes, liquid products of pyrolysis, etc.

It is necessary to remark, that such technologies as underground gasification of coals, extraction of methane from coal layers should be considered equally in the connection with technologies of coal extraction working out a coal deposit. Hydraulic coal mining, use of water coal suspensions can be regarded in focus of highly progressing up-and-coming technologies. There is a strong support to confirm that hydro extraction use at working out layers lying in especially difficult geographical conditions of the Prokopievsk and Kiselevsk regions in Kuzbass can inhale the second life in extracting coal deposit. Moreover it can be possible to produce valuable coking coals for low prime cost.

(http://www.worldcoal.org/coal/coal-mining/)

Ex. 17. Summarize what is said on *the perspectives of Kuzbass mining engineering*.

Listening

Ex. 18. Answer the questions before watching the video, after you watch the video you'll have to check your answers. The questions and the answers are given to you.

1. What country we are going to speak about?
a) Russia b) China c) Germany
2. Is the region famous for …?
a) Industry b) Education c) Natural resources
3. What kind of equipment is supreme in this region?
a) Grader b) Excavator c) Bulldozer
4. Is this machine big or small?
a) Big b) Very big c) Small
5. What is the price of the equipment?
a) 10 million b) 20 million c) 100 million
6. How many years did it take to compose all part of this machine into one unit?
a)1 year b) 2 years c) 4 years
7. What types of mineral deposits can this machine excavate?
a) Coal b) Brown lignite coal c) Rock
8. How many persons must control this machine?
a) 2 b) 4 c) 10
9. How many cubic meters of material can this machine remove?
a) 200 000 b) 100 000 c) 50 000
10. How many people can replace the excavator?
a) 200 b) 10 000 c) 40 000

Ex. 19. Now watch again for the details. Describe technical characteristics of bucket wheel excavators.

Speaking

Ex. 20. Work in pairs, discuss what should be done to increase production growth in Kuzbass. Use the following expressions.

97 facilities, various forms of machine building activities, manufacture of coal and ore mining equipment, electrical appliances, chemical engineering, lathes, tools, instruments, bearings, equipment for light and food industries, equipment for sanitary and bathroom ware production, gas sector and road construction industry equipment.

Ex. 21. Comment on the following, support your argumentations.

1. The chief target of the mechanical engineering holding is to provide cutting-edge mining equipment to the gold mines.
2. The products of the association are supplied to 20 states of the world.
3. The mechanical engineering holding incorporates large machine building complexes called “Gasprom”, “Lukoil” and “Rosneft”.
4. High demand for the equipment with a better performance in the market of mining machinery demonstrates effectiveness of the selected strategy and priorities targeted at adopting innovative production practices.

Ex. 22. Debating.

Work in two groups, one group is thinking over metal tile sheet production organization in Kemerovo, the second group (your business partners) is against such an idea. Organize a business meeting to discuss the following:

- the most advanced, technically simple and at the same time, low-cost business line;
- the volume of low-height housing and private construction;
- the demand for construction and roofing materials;
- production volume does not satisfy all needs of the construction industry in the region;

- high quality requirements;
- high colour range requirements to the product;
- metal tile sheet production technology;
- metal tile sheet production personnel and equipment;
- workers' wages;
- metal tile sheet production profitability, gross and net profit.

Glossary

coal field	месторождение угля; угольный бассейн
extraction	выемка руды
coking coal	коксующийся уголь
industrial center	промышленный центр
coal pit	угольная шахта
steel and iron	сталь и железо
mining	горное дело
metallurgy	металлургия
colliery	угольный рудник, шахта
mining machinery	горные машины, горное оборудование
ferrous and non-ferrous metallurgy	черная и цветная металлургия
power grid	электроэнергетическая система
heating and power station	теплоэлектростанция
power generation	выработка электроэнергии
cutting-edge mining equipment	режущее горное оборудование
hoisting machinery	оборудование подъёмной машины
underground mining	подземная добыча
truck-mounted crane	автомобильный кран
energy circuit	Электросеть
power supply	система электроснабжения
roof support	крепление кровли
conveyor	конвейер; транспортёр
stage loader	перегрузочное устройство
crusher	дробилка; дробильная установка

chain cable handler	траковый кабелеукладчик
hydraulic	Гидравлический
excavator shovel	ковш экскаватора
hydraulic monitor	гидравлический монитор
feeder	загрузочное устройство
press forging	кузнечно-прессовое производство
rolled ring	раскатное кольцо
hammer forging	свободная ковка на молоте
closed die forging	штампованная поковка
cast bar	литая заготовка
precision casting	прецизионная отливка
forging ingot	кузнечный слиток
bottom-poured ingot	слиток сифонной разливки

Вернуться в оглавление

UNIT 4 MINING EDUCATION IN RUSSIA AND GREAT BRITAIN

Warming up

Ex. 1. What do you know about systems of higher education? Answer the questions.

1. Is there any universal system of higher education in the world?
2. What systems of higher education are there?
3. What is meant by English system of education?
4. What does German system of higher education mean?
5. Which system of higher education dominates in West European countries?

Lead –in

Ex. 2. What is the quotation about? How does it refer to the topic under discussion?

"Education is the most powerful weapon which you can use to change the world."

Nelson Mandela

Ex. 3. Find synonyms to the following words.

The finals, diploma, thesis, curriculum, supervisor, method, examine, basis, demand, supply, get, usual, the humanities, skill, tuition fee.

Ex. 4. Give definitions of the following words, if necessary consult English – English dictionary.

- Leadership –
- Invariable –
- Graduation –
- Application –
- Educator –
- Location –
- Qualification –
- Generalization –

Ex. 5. Find out the meanings of the word *last* and translate the sentences below.

1. Last year around 9 000 people graduated from the Kuzbass higher educational institutions.
2. The courses of study last from four to six years.
3. That was the last time I saw her.
4. The holidays came at last.
5. How long would the fine weather last?
6. James II was the last of all the Stuart kings.
7. At last we reached London.
8. When were you there last?

9. This is our last hope.

Reading

Ex. 6. Read the text and explain the meaning of the underlined words in your own way.

Mining Higher Education

Mining education is the system of preparing engineers, technicians, and skilled workers for the coal, ore, chemical raw materials, non-ore construction materials, oil, and gas mining industries.

The creation of the first educational institutions for training specialists in the mining industry dates from the 16th and 17th centuries, when the industrial mining of coal and ore itself began. In Russia mining education began with the organization of mining and metallurgical schools in the 1720's, and later of mining institutes.

In 1724 the first advanced level mining school in Russia was established in Ekaterinburg (now the I. I. Polzunov Sverdlovsk Mining and Metallurgical Technicum), and in 1773 a higher mining college was established in St. Petersburg (now the G. V. Plekhanov Leningrad Mining Institute).

In the 18th and 19th centuries mining education included the study of mining, geology, and metallurgy. In the late 19th and early 20th century the mining, geological, and metallurgical disciplines were made separate specialties – mining engineering, geological mining engineering, and metallurgical engineering.

The Ekaterinoslav Higher Mining College was opened in 1899; the mining department at the Tomsk Technological Institute was opened in 1900; and the Ekaterinburg Higher Mining College - in 1916.

The Moscow Mining Academy (1918), mining institutes in Iuzovka (1921), Kharkov (1922), and Krivoi Rog (1922), and mining departments at polytechnical institutes in Novocherkassk, Tbilisi, Baku, and Vladivostok were founded during the first years of Soviet Union.

In 1930 institutes for the study of mining, petroleum, non-ferrous metals and gold, steel, geological prospecting, and peat were organized under the auspices of the Moscow Mining Academy. After the Great Patriotic War, mining institutes (and departments) were organized in Kemerovo, Irkutsk, Perm, Karaganda, Tula, Alma-Ata, and elsewhere.

In 1971, 115,000 people with mining specializations were studying at higher educational institutions, and 106,000 in technicums. In 1971 higher educational institutions graduated more than 14,300, and technicums, 16,600 mining specialists.

Skilled mine workers (for example, machine operators, drill operators, timberers, tunnelers, and blasters) are trained in a system of secondary vocational-technical schools. About 40,000 mining workers were graduated in 1971. In 1971, 154 secondary vocational-technical schools were training 72,000 students for the coal industry, 124 schools were training 63,000 students for the metallurgical industry, and 80 schools were training 40,000 students for the oil and gas industries.

The Russian system of mining education and the scientific schools of Russian mining scientists (for example, B. I. Bokii, M. M. Protodiakonov-starshii, I. A. Time, I. M. Gubkin, M. M. Fedorov, A. S. Il'ichev, D. I. Mushketov, A. A. Skochinskii, A. M. Terpigorev, A. P. German, E. F. Sheshko, L. D. Sheviakov, and N. V. Melnikov) have received worldwide recognition.

Higher mining education is conducted in the following specializations: mine surveying; the technology and large-scale mechanization of underground mineral mining; the technology and large-scale mechanization of peat deposit mining; mineral concentration; the construction of underground mining structures and shafts; the installation, design, and operation of gas and oil pipelines and storage tanks; the technology and large-scale mechanization of open-pit mineral mining (and of mining oil and gas deposits); mining machinery and structures; machines and equipment for the oil and gas industries; the electrification and automation of mining; the economics and organization of the mining, petroleum, and gas industries; peat machines and structures; and the physical processes of mining production.

(http://encyclopedia2.thefreedictionary.com/Mining+Education)

Ex. 7. Discuss these questions with your partner.

1. What is mining education?
2. When were the first educational institutions for training specialists in the mining industry founded and where?
3. When did mining education in Russia begin?

4. The study of what subjects did the mining education include in the 18th and 19th centuries?

5. Where were the main mining schools established and when?

6. How many people with mining specializations were studying at higher educational institutions in 1971.

7. What specializations is higher mining education conducted in?

8. What Russian mining scientists do you know?

Ex. 8. Fill in the chronological table and speak about history of mining education.

16th century	
17th century	
1720	
1724	
1773	
18th century	
19th century	
1899	
1900	
1916	
1971	

Ex. 9. Give the summary of the text in English.

Moscow State Mining University

Its history can be traced back to September 4, 1918, when Moscow Mining Academy was founded. In 1930 the Academy was divided into six independent institutes. Among the new colleges which grew out of the Academy's departments was Moscow Mining Institute. Since that time Moscow Mining Institute has become one of the largest and best-known scientific centers in the field of mining and one of the leading teaching and research mining schools in the country. In 1993 the Institute was transformed into the State University of Mining, due to its great contribution to mining science and training of highly-qualified specialists for various branches of mining industry.

A multi-level structure of higher education has been introduced at the University. The first four years of University study are known as undergraduate study and usually lead to the Bachelor of Science (B.Sc.) degree. All bachelor's programs include general education in science and engineering, social sciences, arts, and a field of specialization called the major.

The second level, five years together with the first level, may lead to receiving a diploma of a chartered mining engineer. The objective of the program is to give high level specialized training to engineers. A professionally qualified mining engineer must be a graduate proficient in technical management as well as in practical knowledge of actual mining operations.

Students who have excelled as undergraduates may wish to continue their education at the graduate level (the third level). Upon conclusion of two additional years at the University, the student will be awarded with the Master of Science (M.Sc.) degree. The graduate program involves lectures, essay-writing, and a personal case-study.

The academic year is divided into 17-week terms called autumn and spring semesters. Each semester is a unit of study requiring examinations and completion of coursework. The general pattern of teaching at the University is a combination of theoretical training and practical instruction. Towards the end of the second year the student is expected to select his field of specialization. After graduating from the University students may specialize in underground or surface mining, geology and surveying, mineral processing, mining economics and management, ecology and environmental engineering, computing and computer programming, etc.

Six faculties (departments) of the University are currently training over 5,000 undergraduate students and about 300 postgraduates. The faculties of the University are:

- The Faculty of Coal Mining and Underground Construction;
- The Faculty of Ore and Non-Ore Mining;
- The Faculty of Physical Engineering;
- The Faculty of Mining Electrical Mechanics;
- The Faculty of Automation and Computer Science;
- The Faculty of Evening and Correspondence Education.

The University has at its disposal up-to-date research and laboratory facilities, automation and computer systems, recreation centers, hostels and sports facilities. There is a Lyceum for high-school students (9-10 grades) and a preparatory department. Moscow State University of Mining takes orders for conducting research and development. The University has a publishing house of its own. Degrees in mining specialties awarded by the University are valid abroad. There is a military training department.

(http://en.wikipedia.org)

Ex. 10. Discuss these questions with your partner.

1. When was Moscow Mining Academy founded?
2. What was the structure of the Academy?
3. Why has Moscow Mining Institute become one of the largest and best-known scientific centers in the field of mining?
4. What structure of higher education has been introduced at Moscow Mining Institute?
5. What is the third level of education in the University?
6. How is the academic year divided?
7. What is the general pattern of teaching at the University?
8. What subjects may students specialize after graduating from the University?
9. How many departments are there at the University?
10. How many undergraduate students and postgraduates are training at the University?

Ex. 11. Are these statements True or False? Correct the false ones.

1. The University has not at its disposal up-to-date research and laboratory facilities, automation and computer systems, recreation centers, hostels and sports facilities.
2. Nine departments of the University are currently training over 7,000 undergraduate students and about 100 postgraduates.
3. The history of Moscow State Mining University can be traced back to September 4, 1918, when St.Peterburg Mining Academy was founded.
4. A multi-level structure of higher education has been introduced at the University.

5. The second level, five years together with the first level, may lead to receiving a diploma of a chartered mining engineer.

6. The general pattern of teaching at the University is a theoretical training.

Ex. 12. What do we know about mining education in Great Britain? Answer the questions.

1. Is there any special system of higher mining education in Great Britain?
2. What is the structure of mining education system in Great Britain?
3. Which system of higher education is more effective, Russian or English?
4. Is there a multi-level structure of higher mining education?
5. Why is mining important today in Great Britain?
6. What is the structure of mining engineering programs?
7. What degrees can be obtained by students after the graduation of the higher mining educational establishment?
8. What specialization is among the top-10 most in Great Britain?
9. What personal qualities are necessary to become a mining engineer?
10. Where can graduates entering the mining industry work in?

Writing

Ex. 12. Translate the article from English into Russian and entitle it. See Appendix 2,3 for help.

For thousands of years, mining in the earth for minerals, fuels, and metals has been a key part of human societies around the world. Extractive processes provide stone for building, metals for tools, and precious materials like gold and diamonds. Today, mining is as important as ever, and a new class of people – mining engineers – have appeared to handle the complex science of this ancient activity.

As a student of mining engineering, you will learn about all aspects of the mining business, from prospecting and site analysis, to extraction and worker safety. As gold mines, oil wells, and quarries continue to drive

economic development all over the globe, you will be well equipped to take part in this exciting and thriving industrial sector.

Mining-engineering majors take a variety of classes that includes some balance of geological science and engineering techniques. The structure of these programs can vary considerably, and many are designed to teach students how to optimize mining operations in the local area where the program is based.

The majority of students in mining engineering obtain at least a Master's Degree in the field before they seek employment. While undergraduate-level programs do exist, they are uncommon. If you aspire to become a mining engineer, it's a good idea to get a Bachelor's degree in engineering (a double major in engineering along with geology, mathematics, or physics is ideal), then apply to Master's programs in mining engineering. This will provide the specialized knowledge that both graduate schools and employers value in an applicant.

Mining engineering has been found to be among the top-10 most lucrative college majors, along with several other engineering fields. Economies around the world, from the USA to sub-Saharan Africa, depend on having qualified mining engineers to oversee large-scale extraction operations, and so there are plenty of well-paying jobs available. In addition, many mining engineers develop an expertise in locating deposits of precious minerals prior to setting up a mining operation, which is an extremely valuable skill in the mining industry.

To become a mining engineer you are to have such personal qualities as:

- interest in science and mathematics, especially physics and chemistry,
- strong problem-solving and logical thinking skills,
- patience, diligence, and work ethic – willingness to work on complex problems for an extended period of time,
- attention to detail and good organization.

Training is also available for specific mining industries in sectors such as coal, metalliferous, extractive, explosives and drilling. Graduates entering the mining industry can work in many fields and countries in roles such as: environmental scientist or engineer, minerals process or mining engineer, mine rehabilitation specialist, geologist, researcher or laboratory technician, mine planner, surveyor, underground miner.

(http://oilprice.com/Alternative-Energy/Renewable-Energy/Peak)

Ex. 13. Summarize what is said on *mining education in Russia and Great Britain*.

Listening

Ex. 14. a) Before listen to a presentation try to describe innovations in engineering education in future. What subjects should a future engineer study from your point of view?

b) Listen to a presentation and say in which order is the following done?

- ☐ **A –** minority engineering program
- ☐ **B –** engineering program for women
- ☐ **C –** new generation of engineers
- ☐ **D –** innovative engineering education
- ☐ **E –** modern world of innovations

Ex. 15. Watch the video once again and answer the questions.

1. How many years does the engineering education exist?
2. What defines engineering education?
3. What year was the First Freshmen Engineering Department organized?
4. What researches did the department do?
5. Who was Albert Spalding?
6. What purpose was 100 million dollars spent for in 1950?
7. Why is First Freshmen Engineering Department specific?
8. What year did the engineering program for women appear?
9. Why are women attracted in engineering?
10. Is engineering setting trends? Why?

Speaking

Ex. 16. Work in pairs and compare educational requirements for mining engineers existing in technical universities of Russia and the UK.

Ex. 17. Discuss in groups pros and cons of foreign educational system in the sphere of preparing mining engineers and the educational system of Russian higher technical school. Present the project "Me and my speciality".

Ex. 18. Work in pairs.

You are a future mining engineer. Discuss in pairs what is engineering, what qualities the engineer should possess in order to be successful.

Discussion points

1. Explain clearly and as fully as possible, why is the engineer not free to select the problem which interests him?
2. What does efficiency mean to the engineer?
3. Give clear illustration of the emphasis on efficiency. What does efficient functioning depend on?
4. Speak out that any problem involving the low - cost production of large quantities of any item is an engineering problem even if the item itself originated in the work of other disciplines. Explain how any given result of (a) medical research, (b) agricultural research, (c) nuclear physics, (d) optical research is likely to need solutions requiring the skills of an engineer.
5. Explain in details why:

a) "efficiency costs money";

b) "safety adds complexity";

c) "performance increases weight".

6. You have read that engineering solution to most problems is the "most desirable end result taking into account many factors". Does this apply to your own discipline? If so, explain in what way.
7. What do you understand by the definition "engineering of the highest type"?

8. What is your opinion with regard to that "the successful engineer is a malcontent always trying to change things for the better"?

Glossary

substantial	существенный, важный, значительный
full-time student	студент дневного отделения
admission	прием в вуз
support	поддерживать
Free	бесплатный
tuition	обучение
authorities	власти, администрация
experience	опыт
Skill	умение, квалификация
graduation	окончание высшего учебного заведения
application	применимость; представление
chemical raw materials	химическое сырье
geological prospecting	геологическая разведка
auspices	покровительство
mine surveying	маркшейдерская съёмка

Вернуться в оглавление

UNIT 5 OUTSTANDING RUSSIAN SCIENTISTS IN MINING

Warming up

Ex. 1. a) What comes to your mind when you look at this picture? How does it refer to the topic?

b) Try to remember Russian notables who devoted their lives to science. What do you know about them?

Lead –in

Ex. 2. What is the quotation about? How does it refer to the topic under discussion?

"Our talents are the gift that God gives to us... What we make of our talents is our gift back to God."

Leo Buscaglia

Ex. 3. Find synonyms to the following words.

Activity, interaction, creativity, indifference, locate, performance, perform, production, technique, productive, similarity, technician, carry out.

Ex. 4. Give definitions of the following terms, if necessary consult English – English dictionary.

- Straight-line motion –

- Throughout the world –
- Up-to-date methods –
- Long-accepted idea –
- Air-resistance formula –
- Two-thousand-year-old-tradition –
- Inverse-square-law-gravity –
- Rate-of-gain-of-velocity –
- Steam-driven-engine –

Reading

Ex 6. Read the text and explain the meaning of the underlined words in your own way.

A. P. Karpinsky (1847-1936)

V. A. Obruchev, I. M. Gubkin, A. Y. Fersman, V. I. Vernaa 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 geologist, 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, 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 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 became the first elected President of the Academy of Science; the USSR. Students were attracted to him not only because he was a 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.*

(http://en.wikipedia.org)

Ex 7. Are these statements True or False? Correct the false ones.

1. As is known, A. P. Karpinsky was a member of the Academy of Sciences for thirty years.
2. He was one of the academicians who worked at the Institute in St Petersburg.
3. A. P. Karpinsky was a member of many foreign Academies.
4. A. P. Karpinsky compiled a detailed map of the Asian part of our country.
5. He headed the Russian Geological Committee.
6. In fact, A. P. Karpinsky created a new branch of geology namely stratigraphy.
7. He only tried to establish the regularity of movements of the Earth's crust.
8. We may justly call A. P. Karpinsky the founder of the practical geology of the Urals.
9. The Geological Society of Paris elected Karpinsky a foreign member in 1910. He worked in the field of mineralogy.
10. Karpinsky was particularly interested in theoretical geology.
11. We do not know who was the first to introduce the scope in the study of petrography slides.
12. Karpinsky worked on different problems concerning geology but never gave lectures to students.

Ex. 8. Discuss these questions with your partner.

1. What institutions are conducting researches in different fields of science and engineering?
2. What society elected A. P. Karpinsky a foreign member and when?
3. Did he head the Russian Geological Committee or was he a member of that Committee?
4. Did A. P. Karpinsky investigate various regions of the Soviet Union?
5. Which of his works are the most remarkable?
6. What problem was A. P. Karpinsky particularly interested in?
7. What can you say about Karpinsky's investigations in petrology?
8. Do you know what part of geology deals with the origin of minerals?

Ex. 9. Read the text and make the appropriate order of the paragraphs.

A. M. Terpigorev (1873-1959)

A. His two-volume work *Coal Mining and Mine Transport Facilities* is a full description of the state of mechanization and the economy of the Donbass. His other works are about mining transport facilities, mechanization of coal mining and mining machinery. He is one of the pioneers in scientific methods of coal gasification.

B. At the Institute, he studied the full range of subjects relating to metallurgy, mining and mining mechanics. At that time, students' specialization was based on descriptive courses and elementary practical training. One of the best lectures was A. P. Karpinsky. His lectures on historical geology were popular.

C. Academician Terpigorev took a particular interest in mine As a result of his investigations a series of safety measures in gassy collieries was worked out. For some time, he was working on the problem of fire damp, the most harmful and dangerous of all the gas in mines.

D. Academician A. M. Terpigorev is a well-known mining engineer who successfully combined his practical experience with

scientific research. He was born in 1873 in Tambov. In 1892, he finished school with honours and decided to get a higher education. He chose the Mining Institute in St Petersburg, passed all the entrance examinations successfully and became a student of the Mining Institute.

E. During his practical training, Terpigorev visited mines, saw that the miners' work was very difficult. While he was working in the Donbass, he collected material for his graduation paper, which he soon defended. The mining of flat seams in the Donbass was carefully studied and described in it.

F. From 1900 till 1922, Terpigorev worked at Yekaterinoslaw Mining Institute (now the Mining Institute in Dnepropetrovsk). In 1922, he accepted an offer to take charge of the mining chair at Moscow Mining Academy and moved to Moscow. From 1930 he headed the chairs of Mining Transport and Mining of Bedded Deposits at Moscow Mining Institute.

G. In 1897, Terpigorev graduated from the Institute with a first-class diploma of a mining engineer. His first job as a mining engineer was at the Sulin mines where he worked for more than three years first as Assistant Manager later as Manager.

(http://en.wikipedia.org)

Ex. 10. Are these statements True or False? Correct the false ones.

1. After school, Terpigorev decided to work in a mine.
2. Terpigorev collected material for his graduation paper which dealt with mining thick seams in the Donbass.
3. For more than three years, Terpigorev worked at the Sulin mines.
4. In 1922, Terpigorev accepted an offer to take charge of the mining chair at Moscow Mining Institute.
5. He investigated the problems of mine safety.
6. He was one of the first to work on the problem of gasification of coal.

Ex. 11. Discuss these questions with your partner.

1. When and where was Terpigorev born?
2. What institute did he graduate from?

3. What material did he collect while he was working in the Donbass?

4. Where did Terpigorev work from 1900 till 1922?

5. At what institute did Terpigorev head the chair of Mining Transport and Mining of Bedded Deposits?

6. What did Terpigorev take a particular interest in?

7. What works by Terpigorev do you know?

8. What problems do Terpigorev's works deal with?

9. What was the result of his investigations on mine safety?

Writing

Ex. 12. Translate the article from English into Russian and entitle it.

V. I. Vernadsky (1863-1945) is known as the outstanding mineralogist and crystallographer, the founder of geochemistry, biochemistry and radiogeology. Many research centres were established by him. He was elected a president of the Ukrainian Academy of Sciences in 1919. He conducted research in the geochemistry of rare elements. Vernadsky advanced a revolutionary theory of the origin of minerals which was described in his works *An Experiment in Descriptive Mineralogy* and *History of Minerals in the Earth's Crust.* He prospected for the radioactive minerals. The role of such minerals as radium and uranium was forecast by him.

(http://en.wikipedia.org)

Ex. 13. Summarize what is said on *contribution of Russian geologists into science.*

Listening

Ex. 14. a) Before listen to the text try to assume the conditions in which miners worked many years ago, what technologies did they use?

b) Watch the video and answer the questions.

1. What year did the mechanical excavator find an unknown coalmine?
2. Where did he find it?
3. How did a digger discover a mine?
4. How many inches was a mine below the stream?
5. How many inches was coal roof of the tunnel?
6. Why was this coal left untaken?
7. What is known as seat earth?
8. What is a gob?
9. Could children and women work at a mine?
10. What did miners use to transport coal from a mine?
11. What was the process of coal transportation during the Industrial Revolution?
12. How did miners see to work?
13. Was mining a dangerous profession?
14. What were the reasons of mine explosions?

Speaking

Ex. 15. Make-up a dialogue on the topic "What invention would you like to make for our science and people?" Use these words.

Lay the foundation; a prominent Russian scientist; to be connected with; to be at the head of; to took an interest in; to advance the view; to be later confirmed; one's greatest contribution to; to be the first to (do something); the first elected President; to be attracted to.

Ex. 16. Comment on the Terpigorev's statement.

"What I want to say to young people to our country – love your work, put your heart and soul, all your knowledge and ability into it, and

above all, never shirk small jobs, for it is small thing that make up a great accomplishment. Be true patriots".

Ex. 17. Role play.

Work in two groups. One group is technologists, working in the Center of New Polymer Materials. You are to create a new generation polymer material. The creation of such material is always a complex task, involving questions of its structure and properties, creating polymer compositions, processing it into products, quality assessment, certification, etc. The solution of such problem is possible only with the addition of the efforts of different specialists - scientists, technologists, engineers, and economists. In the Center of New Polymer Materials there are experts with extensive experience in building polymeric materials with desired properties and the development of their production.

The experts are opposed to the project. It has several stages, discuss the possibility of the following:

- application of polymeric materials under extreme conditions (different temperatures, aggressive media, prolonged stress, the combined effect of destructive factors);
- a tendency to improve the quality, often even at higher cost;
- a tendency to increase process performance processing into products while preserving the properties;
- tightening of existing and new requirements of environmental, fire and technical nature.

Glossary

to accomplish	совершать, выполнять
to research	исследовать
to appoint	назначать, определять
inventor	изобретатель
observer	наблюдатель
achievement	достижение
investigation	исследование
to behave	поступать, держаться
to favour	благоволить, поддерживать
deductive	дедуктивный
to derive	получать, выводить

to interfere	пересекаться, вмешиваться
to occur	происходить, случаться
planetary table	таблица планет
rules (laws) for the motion	закон движения
at one's own peril	на свой собственный риск
a core of truth	суть, истина
statics and hydrostatics	статика и гидростатика
quadrature and cubature	квадратура и кубатура
to proceed	продолжать, развиваться
to precede	превосходить, начинать
to trace	чертить, следить
to be concerned	быть связанным, быть озабоченным
rigorous	строгий, суровый, точный
to obey	подчиняться, слушаться
vague	неясный, смутный

Вернуться в оглавление

UNIT 6 KUZBASS ECOLOGICAL PROBLEMS

Warming up

Ex. 1. Where can you come across these signs? Do you know what they mean?

Lead –in

Ex. 2. Do you agree or disagree with these ideas? Discuss your answers with a partner.

1. It is not necessary to educate people on the issue of protecting the environment.
2. Cooking the gas is more environmentally friendly than cooking the electricity.
3. Consumers should be obliged to buy only energy-saving electrical equipment.
4. Fossil fuel power plants should be totally replaced by ones using renewable sources.
5. A speed limit 90 km/h should be established throughout the country to conserve oil stocks.
6. People should be encouraged to use public transport and not to use their cars.
7. All houses and buildings should be checked each year for the energy efficiency.
8. A massive green tax should be put on long-distance air travel to protect the environment.

Ex. 3. Do you know the following terms? Match the columns.

a) Backfill	1. Materials excavated from a site and reused for filling the original excavation.
b) Preservation	2. To fill cavities or plug a drill hole with cement or other material to stop loss of water or entrance of unwanted liquids, gas, or fragmented rock into a borehole.
c) Environment	3. The act or practice of preventing waste or loss. The official care, protection or management of natural resources.
d) Renewable	4. Pile of non-ore (waste) material at the entrance of a tunnel or at the collar of a shaft or open pit.
e) Cementation	5. All the conditions and influences affecting the development of an organism, or group of organisms, the natural surroundings, earth, air,

	water and vegetation.
f) Reclamation	6. A term used for safety helmets. It has a hard crown and is worn by miners and others to resist blows to the head.
g) Leaching	7. The action of percolating liquid in order to remove the soluble parts.
h) Non renewable	8. Materials supplied by nature, such as water, air, minerals, and trees.
i) Conservation	9. Any natural resource that require ages of natural processes to produce and cannot therefore, be replaced, finite supply.
j) Dump	10. The soil or rock that covers a mineral source.
k) Hard Hat	11. Authorization from a regulatory authority to conduct permitted activity.
l) Natural Resources	12. Waste material discharged into earth, air or water that is harmful to the environment.
m) Overburden	13. The act of taking measures to save, maintain or preserve something.
n) Permit	14. Process of returning the land to a beneficial use.
o) Recycle	15. Infinite in supply, capable of being refilled, replaced or replenished.
p) Tailings	16. To return, to treat or to process in order to use again.
q) Pollution	17. The waste material left over after mining and milling processes have been completed.

Ex. 4. Find synonyms to the following words.

Prevail, industry, methane, inject, system, organic, ventilation, concentration, potential, actually, restructuring, result, expand, population, industrialization, indicate, degasification, form, candidate, test, project, credit.

Ex. 5. a) Give definitions of the following terms, if necessary consult English – English dictionary.

- Environmental impact –
- Methane emissions –
- Coal mine methane –
- Enhanced degasification –
- Global warming potential –
- Greenhouse gases –
- Ventilation air methane –
- Enhanced coal bed methane –

b) Make the sentences of your own with the words from ex. 5. a)

Reading

Ex. 6. Read the text and explain the meaning of the underlined words in your own way.

Environmental impacts of coal

With the rise in energy demand has come a growing need for coal still the prevailing source of energy for power plants around the world. But today, the coal power industry faces new pressures not only with production, but with methane. Recovering and using the gas is profitable. Recovered methane can fuel vehicles heating systems, dry coal, generate electricity or be injected into natural gas pipelines (methane is the largest constituent o natural gas).

Methane is given off when organic matter decays, and so coal mines are a rich source of the gas. While coal is being mined, the methane escapes and mine ventilation systems have to drain it to prevent explosions. The low concentrations have made this coal mine methane (CMM) difficult to recover from working mines, but that is now changing.

Methane has around 20 times the global warming potential of CO_2. In 2010, worldwide coal mine methane emissions are expected to total 400 million tons. Global coal mine methane emissions actually declined

between 1990 and 2000 because many deep coal mines closed. This happened in China, the largest methane-emitting country. It happened in former Soviet Union countries, which also saw restructuring of the energy industries. It happened in the US, where there was increased methane recovery as well as a move to surface mining, which releases much less methane. It also happened in Europe.

Emissions are on the rise again now, particularly in the developing world as a result of industrialization and fast-expanding populations and economies. Wherever coal production is planned to increase, methane emissions will also rise unless the gas is recovered. It is much easier to prevent non-CO_2 greenhouse gases emissions than CO_2 emissions themselves. The Environmental Protection Agency (USA) encourages recovery internationally indicating three major systems: degasification, enhanced degasification and oxidation of VAM.

Degasification recovers high-quality methane from coal seams. The recovered gas can often be injected into a natural gas pipeline. This is the simplest form of recovery. Where it cannot be injected into pipelines, the methane can be used as a fuel source for gas engines and generating electricity; this method is particularly advanced in Germany and France.

Ventilation air methane (VAM) oxidation removes the gas from working mines using large ventilation fans. Until recently, the low (typically below 1%) methane concentrations in VAM prevented its use. VAM can be burned ($CH_4 + 20_2$ -» $CO_2 + 2H_2O$), to heat water – for steam or heating – or generate electricity. Recovery methods are improving. Particularly, techniques like enhanced coal bed methane (ECBM) look promising. This injects gas – typically nitrogen or carbon dioxide – into coal seams to improve methane recovery like enhanced oil recovery improves oil recovery. Assuming early tests are successful, the technique could be a good candidate for carbon sequestration, particularly for projects receiving carbon credits.

(http://www.worldcoal.org/coal/uses-of-coal/)

Ex. 7. Complete the sentences with the words from A and B.

A	**B**
major	efficiencies
lower	coal
higher	proportion

higher contributor
clean efficiency

1. The greatest problem that coal faces is in its perception that it is a … to global warming.
2. Older coal fired plants operate at much….
3. A large amount of effort is being expended in perfecting ….technology.
4. Coal produces a …. of CO_2 than oil or gas.
5. New coal fired power stations can operate at much …. levels.

Ex. 8. Mark the following sentences T (true) or F (false).

1. Ventilation air methane oxidation (VAM) removes the gas from work mines using large ventilation fans.
2. Techniques like enhanced coal bed methane (ECBM) do not look promising.
3. Degasification recovers high-quality methane from coal seams.
4. It is much more difficult to prevent CO_2 greenhouse gases emissions than CO_2 emissions themselves.
5. In 2010, worldwide coal mine methane emissions are expected to be 400 tons.
6. India is the largest methane-emitting country.
7. While coal is being mined, the methane escapes and mine ventilation systems have to drain it to prevent explosions.
8. With the rise in energy demand a growing need for oil, still the prevailing source of energy for power plants around the world has come.
9. Methane has twice the global warming potential of CO_2.
10. Wherever coal production is planned to increase, methane emissions will also rise unless the gas is recovered.

Ex. 9. Discuss these questions with your partner.

1. Why did global coal mine emissions decline between 1990 and 2000?
2. Why are emissions on the rise again now?
3. What does degasification recover from coal seams?

4. Why is recovering and using the gas profitable?

5. What technique could be a good candidate for carbon sequestration?

Ex. 10. Match left (1—7) and right (a—g).

1. Recovering and using the gas	a) into natural gas pipelines.
2. Methane has 20 times	b) much less methane.
3. VAM oxidation	c) high quality methane from coal seams.
4. Recovered methane can be injected	d) removes the gas from working mines using large ventilation fans.
5. Surface mining releases	e) non-CO_2 greenhouse gases emissions than CO_2 emissions.
6. Degasification recovers	f) is profitable.
7. It is easier to prevent	g) the global warming potential of CO_2.

Ex. 11. Find the words in the text which mean the following.

1) A potentially explosive gas formed naturally from the decay of vegetable matter, similar to that which formed coal. 2) Formed by the composition of organic matter, it is the most common gas found in coal mines. 3) It is a tasteless, colourless, and odorless gas; in mines the presence of impurities may give it a peculiar smell.

Ex. 12. Insert the words from the box into the text below.

Coal, extract, hand, mine, preparation, cleaning, facilities

The Advantages of Clean Coal

Coal, like practically all other material substances which man has learn to (1) ...from the crust of the earth, requires, as a rule, some form of (2) ...to fit it for utilization in the best possible manner in various industries. The process of cleaning (3) ... or the separation of dirt from it, begins in the (4) ... . In recent years the rapid increase in mechanical cutting and loading has hastened mechanical cleaning. By mechanical (5)

... is meant the removal of impurities by mechanical units as compared with hand picking, by which the impurities are removed by (6) .... It is impossible for a mine to turn over to mechanized loading without the addition of some mechanical cleaning (7) .... The problem of coal (2) ... is to take the coal from the mine and to treat it so as to produce the maximum quantities of the most easily marketable grades in the most economical manner possible.

(http://www.economywatch.com/economy)

Ex. 13. The last sentence in the article is removed. You are given several possible endings. Choose the most appropriate (a—c), argue your choice.

Environmental advances

The greatest problem that coal faces today is in the perception that it is a major contributor to global warming. Clearly it is not alone amongst fossil fuels, but it suffers the greatest level of criticism. Coal has the highest carbon — to — hydrogen ratio amongst the fossil fuels producing a higher proportion of CO_2 than such fuels as oil and natural gas.

Modern coal fired power stations operate at efficiencies of 38 % compared with modern combined cycle gas fired plants that operate at 55 % or more. Older coal fired plants operated at much lower efficiencies and their replacement in countries such as China is improving environmental performance from the point of greenhouse gases.

The technology exists where conventional coal fired power stations can operate at much higher efficiency levels. It is possible by increasing internal operating pressures and by using more sophisticated alloys to raise efficiencies. With clean coal technology coal can improve its performance substantially.

The next step in coal-fired technology is to convert coal into gaseous form and then burn it in a combined cycle gas plant. The major problem associated with this technology is cost and without government support it is difficult to see companies making investment in this new technology. Problems with dust emissions and gaseous emissions such as NO_x and SO_x can be controlled employing well established technology.

a) It is anticipated that the technology of coke making will be developed to increase the quantity of semi soft coals in the coke oven blends across the world.

b) These standards also apply to new mining operation in the developing nations.

c) Therefore by replacing older fired plant, improving the technology of conventional plant and installing high technology plant is the next phase of power station construction to improve coals environmental performance overall.

(http://www.economywatch.com/economy)

Writing

Ex. 14. Translate the article from English into Russian and entitle it. See Appendix 2,3 for help.

Building a new economy means eliminating and replacing old industries, restructuring existing ones, and creating new ones. The generation of electricity from wind is one such industry. Soon millions of turbines will be turning wind into electricity. In many countries, wind will provide both electricity and hydrogen. Together, electricity and hydrogen can meet all the energy needs of a modern society.

Another industry that will play an important part in the new economy is management of available water supply most efficiently. Irrigation technology will become more efficient. The recycling of urban waste water will become common. At present, water flows into and out of cities, carrying waste with it. In the future, water will be used again and again, never discharged. As water does not lose its quality from use, there is no limit to how long it can be used, as long as it is cleaned before reuse.

One can easily see eco-economy changes in some countries. It is known that Denmark is the eco-economy leader. It has stabilized its population, banned the construction of coal power plants, banned the use of non-refillable drink containers, and is now getting 15 per cent of its electricity from wind. Besides, it has restructured its urban transport networks; now 32 per cent of all trips in Copenhagen are on bicycles. Denmark is still not close (near) to balancing carbon emission, but it is moving in that direction.

(http://www.bizjournals.com/)

Ex. 15. Summarize what is said on *mining influence on ecology.*

Listening

Ex. 16. Read the text and think about possible words for the gaps. Listen to the text and check yourself.

In the community in which we live a prompt such as the impact of using ___ **1** to make electricity has only environment may not seem the list of relevant for everyday lives. My partner and I have recently learnt ___ **2** the researching and communication with people associated with this business and this problem may in fact affect us directly.

Coal is a non-renewable __ **3** resource because it can't be replenished by human tempering; the ways of regenerating coal include: mining coal, transporting it to power plants and ___ **4** it. Coal is a cheap and abundant source of energy; it emits more carbon dioxide into the atmosphere than any other fossil fuel.

Pennsylvania has a long history of coal mining. Pennsylvania has been among the highest coal produced areas of the world. Although coal is so badly environment ___ **5** it is nearly impossible to the country to stop using it.

According to EPC protocol 50 % of energy of the United States comes from coal. When we heard this statistics we were shocked. Hearing this motivates us to do the research – how coal is used in our country.

After decision to do the research we discovered energy company called "Cancelled Energy Inc.". This is one of the largest ___ **6** in Pennsylvania. We came into the communication with the receptionist from the company and she guided us to the research and development one page which shows the different ways of their shy to make energy clearer.

One of the things we found interesting was Crendlege Multiple Level Control Project. This project is a control system build up to a small power plant as a test to see if it effectively ___ **7** harmful gas emissions into the air. Outside this one page we discovered another way to use coal in more clean way. This is coal gasification – it is a series of reactions that eventually allows us to prevent any harmful impurities such as carbon dioxide into the atmosphere.

You may wonder why we should care about this and how directly it affects us, emissions from using coal are dangerous for our health in greatly contribute to the climate change and global ___ **8**.Another problem with the harmful gases release from using coal is that many people who live in close proximity to a coal mine may be injecting by harmful radiation because coal ash is ___ **9**.

In addition to the use of coal is the fact that mining coal is the most hazardous profession. In spite of the fact that this pretty killer is in the dark we believe that exposing people to this problem will push them to the valuable and safety coal using since we are likely using ___ **10** forever and steps are taken in the right direction.

Ex. 17. Listen to the text once again and answer the questions?

1. Is the problem of environmental protection urgent in modern society?
2. Why is coal widely used for energy production?
3. What are harmful effects of coal usage to the environmental?
4. Are there any ways to minimize coal emissions into the atmosphere?
5. What is the problem of the harmful gases release from using coal?

Speaking

Ex. 18. Work in pairs and discuss in a class the following topic.

Coal mining — particularly surface mining — requires large areas of land to be disturbed. This raises a number of problems: soil erosion, dust, noise, water pollution, etc. Steps are taken in modern mining operations to minimize these impacts. *What steps?*

Ex. 19. Make up your own sentences using the phrase below.

1. The coal power industry faces …
2. Surface mining releases **...**
3. Degasification recovers…
4. Ventilation air methane oxidation…
5. Recovery methods…

6. Methane has around 20 times….

Ex. 20. Work in groups, analyze the following steps in mining operations to minimize the environmental impacts. What measures are taken in Russia? Do we:

- spray water on roads and conveyors?
- use modern mining techniques and special equipment?
- fit drills with dust collection systems?
- let the mined-out area "have a rest" and do nothing?
- plant trees on the mined-out area?
- install noise and vibration monitoring equipment?
- use insulation and sound enclosures around machinery?
- use abandoned mines as storages?
- use methane from coal seams rather than release it to the atmosphere?

Ex. 21. Role-play.

A. You are recruiting a manager try to persuade a specialist to join your safety security company.

B. You are an environmental engineer try to be hot to get for the company.

Glossary

actually	фактически, на самом деле, в действительности, собственно говоря
advanced	современный, продвинутый, передовой, усовершенствованный, прогрессивный
assume	предполагать, допускать, брать на себя (ответственность, управление)
constituent	компонент, составная часть
decay	упадок, спад, разрушение, затухание; разложение (пород)
decline	падение, спад, упадок, ухудшение; истощение (скважины)

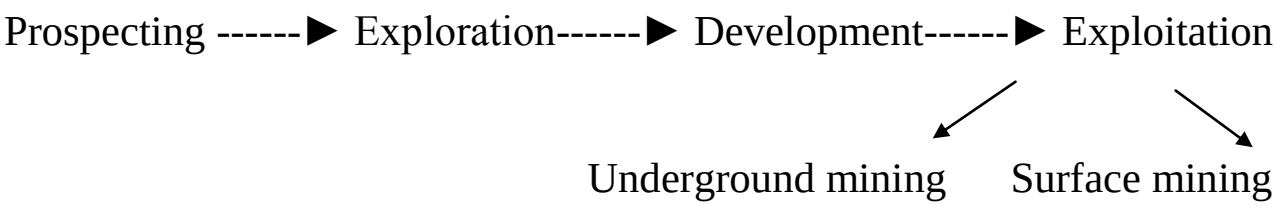
degasification	legазация
demand	требование, запрос, спрос, потребность; потребление (электроэнергии)
look promising	выглядеть обнадеживающе
methane concentration	концентрация метана
organic matter	органическое вещество
fuel; fuel source	топливо, горючее; источник топлива
greenhouse gases emission	выброс «парниковых» газов
inject	вспрыскивать, нагнетать; закачивать (цемент в поры и трещины породы)
pipeline	Трубопровод
profitable	выгодный, прибыльный, рентабельный
prevent explosions	предотвратить взрывы
recovery method	метод добычи
release	освобождение, разрешение, выброс
rise in energy demand	рост потребности в энергии
sequestration	секвестрация
drain	спускное отверстие, спускной патрубок; сброс жидкости, слив, водоотвод; водосток, дренаж
enhance coal bed methane	повышенное содержание метана в угольном пласте
escape	побег, спасение, утечка, течь, просачивание, улетучивание (газа); аварийный выброс

Вернуться в оглавление

UNIT 7 COAL MINING

Warming up

Ex. 1. What does the following scheme show?



Lead –in

Ex. 2. When speaking about mining which of the following statements is not true?

Mining is:

1) the process of extracting minerals like gold, silver, copper and salt, potash, coal and oil formations that concentrate naturally in the earth.
2) the foundation of industrial civilization.
3) the production of methane.
4) an operation that involves the removal of rock and earth.
5) an extracting industry.
6) the process of exacting metallic or nonmetallic formations from the earth.
7) the branch of engineering involving the exploration and removal of minerals from earth.

Ex. 3. Do you agree or disagree with these ideas? Discuss your answers with a partner.

1. When coal is used for fuel in power generation it is referred to as steaming or thermal coal.
2. All mines in Russia are called collieries.
3. Many coals require washing in coal preparation.
4. Coal mining has never been dangerous.
5. Methane has a global warming potential 21 times greater than that of carbon dioxide.
6. The earth above the coal seam is known as surface.
7. The drill holes are filled with explosives and blasted.
8. Methane is a gas formed as part of the process of coal formation.

Ex. 4. Find synonyms.

Process, mineral, indicate, collect, technique, method, progress, ventilation, tunnel, system, secret, mechanical, excavation, compress, electric locomotive, conveyor, machine, technology, operation, dynamite.

Ex. 5. a) Give definitions of the following words, if necessary consult English – English dictionary.

- Mining –
- Seam –
- Hard Rock –
- Drilling –
- Tunnel –
- Shaft –
- Prospecting –
- Exploration –

b) Make the sentences of your own with the words from ex. 5. a)

Reading

Ex. 6. Read the text and explain the meaning of the underlined words in your own way.

Mining

Mining is the process of extracting useful minerals from the surface of the Earth (including sea) usually from an ore body, vein or (coal) seam.

Archeological discoveries indicate that mining was known in prehistoric times. The first mineral found was flint, which could be broken to pieces that were useful as knives and arrowheads. Gold was one of the first metals utilized. Gold was mined from streambeds of sand and gravel. Copper was probably the second metal discovered and used. Silver was also found and was valued more highly than gold. Other hard rock mined or collected for axes included greenstone.

The oldest known underground mine in the world was run more than 40,000 years ago in Swaziland to mine ochre used in burial ceremonies and as body colouring.

The book on mining "De re Metallica" (1556) by the German scholar Georgius Agricola is the best source of information on early mining techniques, many of which are still used or were used until recently: picks and hammers, ventilation and pumping systems and cart-like "tricks" for hauling minerals to name a few. Agricola describes detailed methods of drilling, shafts and tunnels, timber support systems, etc.

Great progress in mining was made when the secret of black powder reached the West, probably from China in the late Middle Ages. Gunpowder was replaced by dynamite in the mid-XIXth century. Since 1956 both ammonium nitrate and slurries (mixture of water, fuels and oxidizers) have come into use.

The invention of mechanical drills increased the capability to mine hard rock decreasing the cost and time for excavation by many times. The first rotary drill appeared in England in 1813. In Germany in 1853 a drill that resembled modern air drills was invented. Pistol drills were followed by hammer drills run by compressed air.

Latter advances included improvements in loading methods, usage of electric locomotives and conveyors, steam-driven pumps to remove water from the deep mines. In 1930s battery-powered cap lamps began entering mines.

Modern mining is a costly and complicated business. It starts with the locating of probable mineral veins. Prospecting and exploration require a great deal of knowledge in the Earth sciences to find likely mining locations. Once the location is determined, mining engineers decide the best way to mine it. Mining can be a surface operation or it can be done by an underground method.

Sometimes a vein of ore runs from the surface deep into the ground. Ore that is found at the surface is mined from the open pit. More than two-thirds of the world's annual mineral production is extracted by surface mining.

The openings made in the process of extracting ore are called stopes. There are two steps involved in stoping: development (preparing the ore blocks for mining) and production (stoping itself).

Technology has developed to the point where gold is now mined underground at depths of 40,000 m, and the deepest surface mines: been excavated to more than 700 m. It is the machines that provide the strength and trained miners who provide the brains needed today to prevail in this highly competitive industry.

(http://everythingscience.co.)

Ex. 7. Mark the following statements True or False, correct the false ones.

1. The first mineral found was copper, which could be broken to pieces that were useful as knives and arrowheads.
2. Technology has developed to the point where gold is now mined underground at depths of 4,000 m.
3. The openings made in the process of extracting ore are called shafts.
4. Ore that is found at the surface is mined from the open pit.
5. The book on mining "De re Metallica" by Agricola is the only source of information on early mining techniques.
6. The first rotary drill appeared in Germany in 1813.
7. Hammer drills were followed by pistol drills run by compressed air.
8. Modern mining is a costly and complicated business.
9. Copper was also found in a pure state and at one time was valued more highly than gold.
10. It is the machines that provide the strength and trained miners who provide the brains needed today to prevail in this highly competitive industry.

Ex. 8. Discuss these questions with your partner.

1. How is ore that is found at the surface mined?
2. How many steps are there in stopping?
3. How can mining be done?
4. When was great progress in mining made?
5. What does Agricola describe?

Ex. 9. Match left (1-7) and right (a-g).

1. Mining is the process	a) the second mineral discovered.
2. Mining was known	b) appeared in England in 1813.
3. Prospecting require	c) a costly and complicated business.
4. Copper was	d) a great deal of knowledge in the Earth sciences.
5. The first rotary drill	e) of extracting minerals from the surface of the Earth.
6. Modern mining is	f) as a surface operation.
7. Mining can be done	g) in prehistoric times.

Ex. 10. Insert the missing words in the following text.

1) energy, 2) normally, 3) rotate, 4) matter, 5) crushed, 6) steam, 7) organic

Coal is an (a ...) material that is made from decomposing plants that lived millions of years ago. Plants capture (b ...) from the sun and through the process of photosynthesis use the solar energy to make plant (c ...). Over million of years this plant matter accumulated and was buried in the earths' surface where it was (d ...) from the earths' weight. It (e ...) takes millions of years for coal to form but after burning it for only a few moments it releases its stored energy! Generally, coal is burned to create (f...) which is then piped at a very high pressure over a turbine, which will begin to rotate very quickly. It is rotating motion that causes electricity!

Ex. 11. Make up the text from the following scrambled extracts.

Early History of Coal Mining

1. ... coal for smelting began in 475-221 BC. In the XIth century, the demands for charcoal of Chinese iron industry led to deforestation. With the advent of coal replacing charcoal in the iron smelting process, thousands of acres of prime timberland were spared in China. China remained the world's largest...

2. In 2005 a 20,000-year-old Stone Age coalstone hunting camp was discovered by archaeologists in an opencast coalstone mine in Germany. The Chinese mined coalstone for fuel 10,000 years ago at the time of...

3. ...was by the Aztecs. They used coal not only for heat but as ornaments as well. Coal deposits were discovered by colonists in eastern North America in the XVIIIth century.

4. ...New Stone Age. "People in Shanxi, now the largest coal production base, have been burning coal as fuel since then." Coal usage was widespread in various parts of the world by the Bronze Age, 2000—1000 BC. Chinese usage of...

5. ... producer and consumer of coal until the XVIIIth century. Roman historians describe coal as a heating source in Britannia. The earliest use of coal in the Americas...

(http://en.wikipedia)

Writing

Ex. 12. Translate the article from English into Russian and entitle it. See Appendix 2,3 for help.

When Sherwood Copper of Vancouver started the Minto mine in 2007, it was an open-pit copper-gold-silver operation with a projected four-year mine life and a 1,600-tonne-per-day throughput.

Located in a growing mining district near Carmacks, about 250 km northwest of Whitehorse, Sherwood was convinced that its Minto mine had the potential for more than 1,600 tpd and so did Capstone Mining, also from Vancouver, and in 2008, the then-small copper producer inked a deal to merge with Sherwood.

Following the merger, Capstone continued what Sherwood had started and through subsequent exploration and expansion, today the Minto mine churns through 3,850 tonnes per day and has a mine life stretching to 2019, with milling to 2022.

Minto is a conventional mine in most senses: ore is mined, crushed, ground and floated to produce a copper concentrate bearing gold and silver credits. The concentrate is thickened and dewatered before being loaded onto trucks and transported to the Port of Skagway in Alaska. From there it is shipped to smelters across the Pacific.

(http://www.infomine.com)

Ex. 13. Summarize what is said on *advantages and disadvantages of being a miner.*

Listening

Ex. 14. a) Before watching the video say are these statements true or false.

1. Coal is a rock that burns.
2. Coal is formed from inorganic matter.
3. The process of coal formation started 5 million years ago.
4. Peat is formed at the top of a swamp.
5. There are 5 major types of coal.
6. There are 3 main methods of coal excavation.
7. Coal is found in every country of the world.

b) Now watch the video and check yourself.

Ex. 15. Watch the video once again and answer the questions.

1. What is coal?
2. What main types of fossil fuels do you know?
3. What is the process of coal formation?
4. How and where is peat formed?
5. What are the main coal types and their characteristics?
6. In how many states of the USA is coal found now?
7. What is the thickness of Kentucky coal seams?
8. What is the amount of Kentucky coal reserves?

Speaking

Ex. 16. Make up sentences from the following words.

1. Coal one is requirements the worlds energy providing of worlds energy major the sources in 2000 24.9% of primary.
2. Coking always coal bituminous comes the from category.
3. All can categories be of used generation for electricity coal.

4. An have a low feature important coal by the steel they should level of industry ash and of all used sulphur is that.

5. Coal contributor warming major to is a global.

Ex. 17. Make up your own sentences using the phrase below.

- the process of extracting ore;
- the capability to mine hard rock;
- improvements in loading methods;
- likely mining locations;
- steam-driven pumps;
- highly competitive industry;
- surface operation;
- probable mineral veins;
- underground method;
- a great deal of knowledge.

Ex. 18. Read and discuss the following with your partner.

There are many different jobs in the mining industry: engineers and lab technicians, geologists, environmental specialists, accountants, lawyers, sales representatives and public relation specialists, not to mention thousands of men and women who manufacture the machines and equipment to mine minerals. ***But who works underground every day? Is it dangerous to work underground? What skills and qualification should a specialist have to do such work?***

Ex. 19. Work in pairs discussing the organizational structure of a local mine you know about. Your partner will have to ask questions about the mine's structure and its activity. You must be ready to discuss most of the questions with your partner.

The discussion points:

- type of the mine,
- mine structure,
- mine size,
- mine performance.

Ex. 20. Role-play.

Work in two teams. Each team is to work out the engineering project, the first team makes the project “Innovative methods in surface coal mining”, and the second team - “Innovative methods in underground coal mining” . Make the presentation of each project.

Glossary

extracting	добыча (минералов)
hammer	молот, кувалда, геологический/отбойный молоток
hard rock	крепкая/твердая/скальная порода
improvements in loading methods	модернизация методов погрузки
invention	изобретение, открытие
location of probable mineral veins	определение вероятного местоположения жил полезных ископаемых
open pit	карьер, открытая разработка (минералов)
ore body, vein or seam	рудное тело, жила или пласт/прослоек
prospect	производить изыскания
prospecting	разведочные/рудоискательные работы
explore	исследовать
exploration	исследование месторождения
provide	обеспечивать, снабжать, предоставлять, оснащать
require	требовать(ся), нуждаться (в чем-либо)
shaft and tunnel	шахта/ствол шахты и штольня
source of information	источник информации
steam-driven pump	паровой насос
stope	выемочная камера
surface of the Earth	земная поверхность
surface operation	открытая горная разработка, разработка открытым способом
timber support	система деревянной крепи

system	
underground method	разработка подземным способом
value	значение, величина, цена, стоимость
ventilation and pumping system	вентиляционная и насосная установка
battery-powered cap lamp	шахтерская лампа с батарейным питанием
competitive	конкурентоспособный
determine	определять, устанавливать, измерять, вычислять
discover	открывать, обнаруживать
excavate, excavation	вынимать грунт, производить земляные работы

Вернуться в оглавление

UNIT 8 ROCKS OF THE EARTH CRUST AND USEFUL MINERALS

Warming up

Ex. 1. Think of how can useful minerals be related to our life?

Lead –in

Ex. 2. What do you know about coal? Answer the questions.

1. Have you ever seen coal?
2. Is coal a gaseous, liquid or fossil fuel?
3. What is it like?
4. What do we need coal for?
5. Can society do without coal?

Ex. 3. What do you know about useful minerals? Answer the questions.

1. How much coal is left in the world? In Russia?
2. Where is it?
3. What will be the energy demand in the world? In Russia?
4. What will be the implications for $C0_2$ emissions in the world? In Russia?
5. What will be the investment in energy up to 2030?

Ex. 4. Find synonyms to the following words.

Formation, vegetation, part, contain, generation, solid, rank, operate, scale, reserves, create, technique, characterize, product, distribution, activity.

Ex. 5. a) Give definitions of the following terms, if necessary consult English – English dictionary.

- Bituminous coal –
- Anthracite –
- Fossil fuel –
- Lignite –
- Coalification –
- Non-coking coal –
- Soft coals –
- Sub-bituminous coal –

b) Make the sentences of your own with the words from ex. 5. a)

Reading

Ex. 6. Read the text and answer the questions after it.

Coal

Coal is a solid, dark colored, carbon-rich material that occurs in stratified, sedimentary deposits. It is composed mainly of carbon (50 – 98 %), hydrogen (3 – 13 %) and oxygen, and smaller amounts of nitrogen, sulphur and other elements. It also contains a little water and grains of inorganic matter that remain as a residue known as ash when coal is burned. It is one of the most important of the primary fossil fuels. Coals are found in many parts of the world. They occur in deposits both near the Earth's surface and at various depths.

How was coal formed?

Coal formation began during the Carboniferous Period – known as the first coal age – which spanned 360 million to 290 million years ago.
Coal is the altered remains of prehistoric vegetation that originally accumulated in swamps and peat bogs. Silt and other sediments buried these swamps and peat bogs often to great depths. High temperatures and pressures caused physical and chemical changes in the vegetation, transforming the plant material into peat and then into coal.

The quality of each coal deposit is determined not only by temperature and pressure but also by the length of time in formation, which is referred to as its “organic maturity”. Initially the peat is converted into lignite or “brown coal” - these are coal types with low organic maturity. Lignite is quite soft and its colour can change from dark black to various shades of brown.

Over many more millions of years, the continuing effects of temperature and pressure produces further change in the lignite, increasing its organic maturity and transforming it into "sub-bituminous" coals.

Further chemical and physical changes occur until these coals became harder and blacker, forming the "bituminous" or "hard coals". It is interesting that under the right conditions, the progressive increase in the organic maturity can continue, finally forming anthracite.

(http://en.wikipedia)

1. What is coal?
2. Why coal is one of the most important of the primary fossil fuel?
3. What is the quality of each coal deposit determined by?
4. What types of coal are used for power generation?

Ex. 7. a) Read the text and answer the questions after it.

Types of coal

Coal can be classified in various ways. The most widely used classification is based on the degree to which coals have undergone coalification. The degree of change undergone by a coal as it matures from peat to **anthracite** – known as **coalification** – has an important bearing on its physical and chemical properties and is referred to as the "rank" of the coal.

Low rank coals such as lignite and **sub-bituminous coals** are typically softer, friable materials with a dull, earthy appearance. They are characterised by high moisture levels and **low carbon content**, and therefore a **low energy content**.

Higher rank coals are generally harder and stronger and often have a black, vitreous lustre. They contain more carbon, have lower moisture content, and produce more energy. Anthracite is at the top of the rank scale and has a correspondingly higher carbon and energy content and a lower **level of moisture**.

Between anthracite and peat there are three broad coal rankings.

Bituminous coals are dense black solids, frequently containing bands with a brilliant lustre. The carbon content of these coals ranges from 78 to 91 percent and the water content from 1.5 to 7 percent. These coals are suited to the production of metallurgical coke. Non-coking bituminous coals are used for power generation, cement making and to provide heat and steam in industry.

Sub-bituminous coals usually appear dull, black and waxy. They have a carbon content between 71 and 77 percent and a moisture content of up to 10 percent and are used for electricity generation or can be converted to liquid and gaseous fuels.

The lower ranked coals are browner and softer.

Brown coals or lignites have a high oxygen content (up to 30 percent), a relatively low carbon content (60-75 percent), and a high moisture content (30–70 percent). Brown coals are used for power generation but generally are uneconomic to transport because of their high moisture content. These coals are also susceptible to **spontaneous combustion**.
The mineral or inorganic content of coal is another significant factor affecting end use. Mineral content is assessed by burning coal and measuring the amount of incombustible material remaining, referred to as the **ash content** of coal.

Coal has long been used for power generation, for the production of metallurgical coke, and as a source of various aromatic compounds in synthesizing dyes, solvents, and drugs. It is also has been converted into gases for use as fuel.

(http://en.wikipedia)

1. How can coal be classified?
2. What is the most widely used classification based on?
3. What is known as coalification?
4. What is it the “rank” of the coal?
5. What are the low rank coals?
6. What are the higher rank coals?
7. What types of coal are there?
8. What are characteristics of bituminous coals?
9. What are characteristics of sub-bituminous coals?
10. What are characteristics of brown coals?
11. Why has coal been used for power generation?

b) Look at the text again and give Russian equivalents to the underlined word combinations. Consult Appendix 1 if necessary.

Ex. 8. Mark the following statements True or False, correct the false ones.

1. Lignite is hard and its colour can change from brown to various shades of green.
2. Anthracite has a high carbon and energy content and a low level of moisture.

3. Brown coals are uneconomic to transport because of their high moisture content.

4. The lower ranked coals are browner and softer.

5. Higher rank coals contain less carbon, have lower moisture content, and produce less energy.

6. Between anthracite and peat there are ten main coal rankings.

7. Brown coals are never used for power generation.

8. Hard coals are also susceptible to spontaneous combustion.

9. Initially peat is converted into anthracite.

10. Physical and chemical changes in the vegetation were caused mainly by rains.

Ex. 9. Match left (1-7) and right (a-g).

1. The quality of each coal deposit	a) is assessed by burning coal and measuring the amount of incombustible material re-maining.
2. Coal	b) is used to provide heat and steam.
3. Initially the peat	c) is at the top of the rank scale.
4. Low rank coal	d) is converted into lignite.
5. Anthracite	e) is characterized by high moisture level.
6. Non-coking coal	f) is uneconomic to transport.
7.Non-coking coal	g) is composed mainly of carbon, hydrogen and oxygen.
8. Brown coal	h) is used for power generation.
9. Mineral content	i) is determined not only by temperature and pressure but also by the length of time in formation.

Ex. 10. Insert the words from the list in the text below.

1) as early as 2) large-scale 3) extensive 4) in the late

Coal has been mined for more than 1,000 years and ... (a) mining was practiced ... (b) the 18th century. The first coal mine in America was opened ii Virginia in the Appalachian bituminous field during the 1750s. The mining of anthracite began ... (c) 1700s. ... (d) mining in the United

States commence about 1820. Until 1854 more than half of all the coal that was produced in the U.S. was Pennsylvania anthracite. In 2000 anthracite production was about 4.15 million metric tons compared to about 970 million metric tons of bituminous coal and lignite.

Writing

Ex. 11. Translate the article from English into Russian and entitle it. See Appendix 2,3 for help.

According to the recent World Coal Institute reports coal share demands about 90% of energy potential of all organic minerals for working out in the world. At an existing consumption level the limiting exhaustion of world's oil and gas reserves will have been expected by 2035.

Apparently by 2015 the world needs for coal can have been doubly increased. In the third millenium coal will take the foreground position and become the major energy carrier. Taking into account maintaining of power safety in Russia, coal should be extracted about 290–335 million tons - in 2010, and in 2020 - about 340-430 million tons, with the further increasing of extraction volumes. It will provide increasing coal share in FEB (Fuel Energetic Balance) to 25-30 % instead of present 17 %. No doubt, that the basic manufacturer of coal in Russia is the Kuznetsk Coal basin (Kuzbass).

Kuzbass reserves of coal (category A+B+C1) are estimated 57 billion tons, that makes 58,8 % of Russian coals. Thus coking coal reserves make 30,1 billion tons, or 73 % of all reserves in the country.

In fact, almost all the ranks of coals are extracted in Kuzbass. Kuznetsk coals are remarkable for high quality: ash content 8–22 %, sulfur content - 0,3–0,6 %, specific heat of combustion – 6000–8500 kcal/kg. The average depth of underground mining is 315m. About 40 % of extracted coal is consumed in the Kemerovo region and 60 % are taken in other regions of the country and used for export.

Now 55,8 % of extracted coals are in processing, with an output 44,2 % of the concentrated ones and 11,6 % of high-quality coal that gives additional profit of 10-15 %. It should be noticed that a lot of concentrating plants become out-of-date. It causes low labour productivity

- 500 tons a month per a worker. The increase in processing volumes of Kuznetsk coals will allow not only receiving the big profit in sale of the concentrated and high-quality coals at home market. It will give a great effect in macroeconomics because the ballast expenses will be lowered to 10–12 % by rail transportation, and to 8–12 % electric power and heat cost in the TPS (Thermal Power Station).

(http://www.uglemetan.ru)

Ex. 12. Summarize what is said on *major problems affecting the performance of mining industry.*

Listening

Ex. 13. Before you watch the video read the text and think about possible words for the gaps. Watch the video and fill in the gaps.

The surface of the ___**1** is made up of rocks which contain over 2 000 different kinds of minerals. Many of these aren't really seen because they are very deep within the Earth.

The hardness of these rocks and ___**2** is responsible in part for the Earth's landscape. Mountain reaches are held up by rocks formations which are ___**3** of hard, __ **4** minerals. Valleys and lowlands exist with the minerals in a rock which are easily broken down and washed away.

This doesn't mean that all mountains contain the same __ **5**, because there are so many varieties of hard and soft minerals and also, because some minerals which are joinable in one climate are easily decomposed in another. The soils which support all __ **6** are composed of mineral fragments weathered from once solid rock. These mineral fragments and the kinds of minerals in the hard rock beneath the __ **7** cover determine the thickness and richness of the soil.

The world of men made articles depend on the elements obtainable from minerals, for example both the cheapest bottle and the most expansive camera are made of the elements silicon and oxygen combined in the mineral cores. The metals of cars, steel buildings, manufacture machinery these are all obtained through the efforts of men exploring, sampling, testing and finally ___ **8** ore coring in order to extract milling ores from the otherwise useless rock. Every step of our modern existence is added by ___ **9** and development about ___ **10**.

Ex. 14. Listen to the piece of video "Introduction to Rocks and Minerals" and answer the questions?

1. How many minerals are there in the Earth?
2. Can we see all these rocks and minerals?
3. What is soil composed of?
4. How can men use different kinds of mineral resources?
5. Why are mineral resources so important in our modern life?

Speaking

Ex. 15. Make up a dialogue on the topic "What are the coal prospects for coal production, supply and use in the Russian Federation?"

Ex. 16. Read and discuss the following with your partner.

1. In Australia, colliery only refers to an underground coal mine.
2. Mountaintop removal is a technique that is applied in Appalachia in the United States.
3. According to the Bureau of Labor Statistics (USA), mining remains the second most dangerous occupation in America.
4. Most open cast mines in the United States extract anthracite.
5. The mobile roof supports are similar to a light tent.
6. The mine roof usually collapses once the mobile roof supports travel out to a safe area.
7. The top five coal mining nations are: China, UK, Spain, Russia, Poland.
8. A mixture of carbon dioxide and nitrogen in a mine can cause suffocation.
9. The coal industry does nothing to improve its environmental performance.
10. The World Coal Institute is a non-profit, non-governmental association.
11. The World Coal Institute is situated in Moscow.

12. Coal mining can cause a water pollution called Acid mine drainage.

Ex. 17. Discuss the following with your partner.

- changes in the vegetation
- low rank coals
- physical and chemical properties
- under the right conditions low organic maturity
- increase in the organic maturity
- high moisture level
- low carbon content
- susceptible to spontaneous combustion
- incombustible material

Ex. 18. Role play.

Work in two groups. The fist group is the plant superintendents and they are worried about machinery maintenance. The second group is workers maintaining and repairing factory equipment. Discuss the the possibility of the following:

- the safety of work equipment depends on the installation conditions, it should be inspected after installation and before first use, and after reassembly at any new site /location,
- the suitable intervals, where work equipment is exposed to conditions causing deterioration liable to result in dangerous situations,
- each time exceptional circumstances (eg. major modifications, known or suspected serious damage, substantial change in the nature of use) are liable to have jeopardized the safety of the work equipment,
- operating environment (eg. the effect of temperature, corrosion, weathering),
- user knowledge and experience,
- the risk to health and safety from any foreseeable failure or malfunction,
- management issues, including safe systems of work, supervision, monitoring,

- personnel competence (training, skill, awareness and knowledge of risk).

Glossary

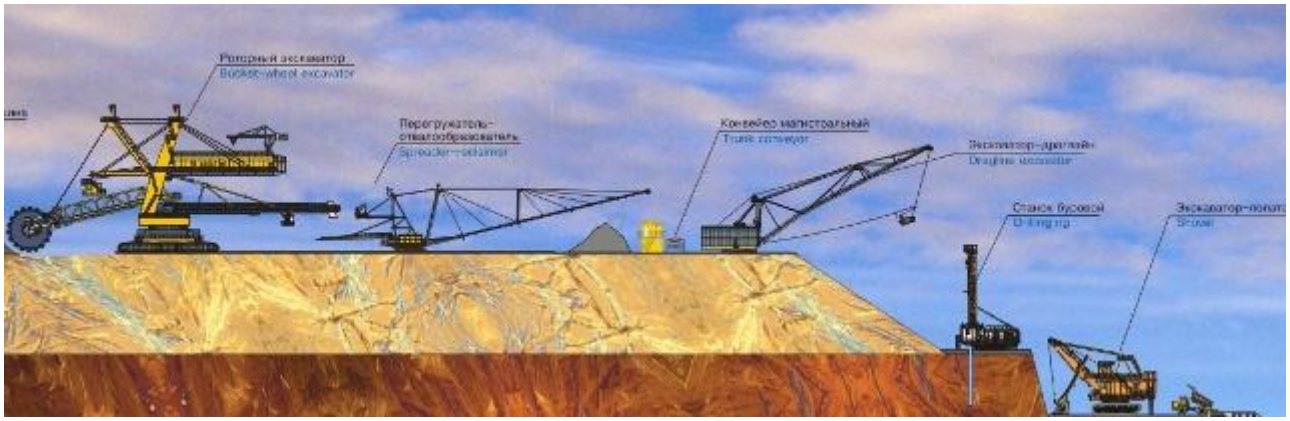
ash content	содержание золы/зольность
assess	определять, оценивать
carbon content	содержание углерода
coalification	углефикация, карбонизация, обугливание
bituminous coals	битуминозный/жирный
sub-bituminous coals	слабобитуминозный уголь
hard/soft coals	антрацит/битуминозный уголь
non-coking coals	некоксующийся уголь
contain	содержать
convert	преобразовывать, трансформировать
dull, black and waxy	матовый/мутный; черный и восковой
fossil fuel	твёрдое топливо
high/low moisture level	высокий/низкий уровень влажности
incombustible material	невоспламеняемый/негорючий материал
liquid and gaseous fuels	жидкое и газообразное топливо
measure	мера, единица измерения
mineral or inorganic content	минеральное или неорганическое содержание
physical and chemical properties	физические и химические свойства
provide heat	обеспечивать теплом

Вернуться в оглавление

UNIT 9 MECHANIZATION AND AUTOMATION IN MINING

Warming up

Ex. 1. Think of how can mechanization improve mining industry?



Lead –in

Ex. 2. What do you know about mechanical technologies of coal extraction? Answer the questions.

1. What is heavy machinery needed for in mining?
2. What machines are important for digging into the land, especially in surface mining?
3. Why is underground mining tend to be more technologically sophisticated?
4. When are trams used?
5. Why are cutter-loaders widely used underground?
6. Who operates the machines in manless faces?

Ex. 3. Find synonyms to the following words.

Damage, deterioration, dimension, failure, form, major repair, operation, overhaul, performance, shape, size, wear, price, material.

Ex. 4. a) Give definitions of the following words, if necessary consult English – English dictionary.

- Dragline –
- Shovel –
- Truck –
- Overburden –
- Cutter-Loader –
- Face –
- Bench –
- Trench –
- Loader –

b) Make the sentences of your own with the words from ex. 4. a)

Ex. 5. Make up sentences from the following words.

1. needed, heavy machinery, is for exploration, in mining, and development, to remove, to break and stockpile overburden and remove rocks, well as, for reclamation to process the ore as.

2. surface bulldozers, in mining, are, drills, trucks important.

3. technologically sophisticated, tend to be more, because of the dangers and the expense, of subsurface tunneling, underground mining.

4. used, trams, are, to transport miners, minerals and waste.

5. for mechanizing coal mining, cutter-loaders, are, widely used, underground, these machines, because are the most means, progressive.

Reading

Ex 6. Read the text and answer the questions after it.

What is the history of automation in mining?

Even though automation has been around in processing plants for a while it hasn't really made history in mining operations. It is really only in recent years that mining companies and suppliers to the mining industry have realized that there is opportunity to tackle and improve the needs,

challenges and demands of the ever-demanding global mining sector, especially in operations.

The first thing should be highlight is automation means many things to different people. There are some perceived opinions that automation can't do what man can; some even suggest it is impossible.

Some of the key challenges for automation in mining are these:

- Dealing with a very dynamic outdoor and underground environments;
- There is a growing need for mobile assets to communicate in wide areas;
- There are too many specialist systems that do not interface or collaborate;
- Data is inaccurate and out of date, no single source of truth;
- Too much manual interference.

Ultimately there are 3 key KPI's that set the success criteria for automation – 1) Employee safety; 2) Increase Productivity; and 3) Containment/reduction of costs; and if the technology can add value in these areas as well provide a platform for automation then companies will see the immense value in investing in an automation strategy at the operations level.

First and foremost I think companies and company executives need to open their minds and look at how they can better achieve the KPI's. It is a mind shift for many. Our attitude is: "how can we help educate and move clients along in this process?" because we know we have technology nobody else can offer. Secondly it is forums like Mining IQ that also deliver valuable content and help educate the industry further.

Miners need to be less reluctant to apply/use technology because it is obvious that those 3 KPI's can't be improved without technology. Now suppliers are the biggest problem today. Pseudo innovations and lack of collaboration are offering the miners nothing but false hope and no light in the end of the tunnel.

Automation alone means nothing, technology alone means nothing. It is a combination of People + Process + Technology. The hardest job today is to keep this balance. Automation may cut some jobs on the field but those people and their knowledge and experience are needed in other roles. Miners need also to develop their people if they need them remotely operating machines, supervising machines, maintaining the who process.

The problem is that it takes decades to prepare people. So the mines concerned about the future, the next decades, etc. should think in a program for the people in 10, 20 years and not just how their pits or tunnels are going to be.

The complexity of automation and challenge of interface with other systems is something that we come up. Suppliers to the mining industry have simply worried about themselves and not actually to the needs and future challenges of their client's operations. Nobody has been interested in taking a collaborative approach.

However we have addressed this to produce a world first mine asset management, operations and automation technology for open-pit and underground using a totally 'open and extensible technology architecture'. Simply our new Extreme software has the ability to manage, control, regulate, optimize and automate all mining assets including work teams. Not only that by providing an open-architecture we are able to integrate to any other systems.

(http://www.miningiq.com/technical-services)

1. What are the challenges (both perceived and actual) for automation?
2. What does the industry need to do to move forward, how can we apply this and move past the glass ceiling?
3. What are 3 key KPI's that set the success criteria for automation?
4. What does automation really mean in mining and how do you counter arguments about loss of jobs?
5. Is the complexity of automation and challenge of interface with other systems something that you come up against and how do you overcome this?

Ex. 7. Mark the following statements True or False, correct the false ones.

1. Miners need not develop their people if they need them remotely operating machines, supervising machines, maintaining the who process.
2. Mining personnel must be highly skilled and well trained in the use of complex, state – of – art instruments and equipment.
3. Sensors detect how much coal remains in the seam while robotic controls enhance efficiency.
4. The machines to be employed at the mine are of old design.

5. Surface mining equipment has decreased dramatically in size over recent years.

6. Excavators are the main types of machines used for stripping overburden and excavating minerals.

7. In open-cast mining wheeled scrapers are not widely used.

8. There is a growing need for mobile assets to communicate in wide areas.

Ex. 8. The first sentence from the extracts A - D is missing. Choose from 1 - 4, argue your choice.

1. The human factor is a critical point for mine safety at Russian coal mines and has to be addressed adequately.

2. Several hazards present at the same time, such as methane, rock and gas outbursts, dust and others, are typical for Russian coal mines.

3. Mine safety is an essential issue for the Russian coal mine sector.

4. One of the most essential issues of mine safety for Russian coal companies is degassing and ventilation.

Advanced Mine Safety Technologies - The Key to Profitable Mine Operations

A) ...Improvements of the mine safety have become a key factor for further development of coal mining in Russia. Therefore, the largest Russian coal companies scrutinize this issue intensively and have started programs of modernization of their mine safety systems and organization. They would like to benefit from advanced technologies and world experience in this field.

B) ...Hence, comprehensive mine safety measures based on modern technologies are needed. The installation of equipment and application of techniques designated to resolve the individual problems can only yield a limited increase of mine safety.

A complex approach ensuring mine safety at coal mines should prevail. Russian coal companies are most interested in "mine safety technologies" that includes not only the equipment but also the know-how associated with it.

C) ...As coal mine methane is one of the most dangerous sources of mine accidents, its elimination from mine workings decreases the risk of accident. Advanced degassing and ventilation technologies are of prime interest to Russian coal companies. Several degassing and ventilation projects are envisaged in the nearest future.

D) ...Mostly stemming from economical and sociological circumstances, possible measures, such as training, can affect the present situation and increase mine safety.

(http://www.miningiq.com/technical-services)

Writing

Ex. 9. Translate the article from English into Russian and entitle it. See Appendix 2,3 for help.

Coal underground gasification technology is an up-to date method of working out coal deposits. It finds out new possibilities in working off coal layers in difficult geological conditions of occurrence. This method combines extraction, concentration and coal processing. Coal underground gasification technology includes drilling wells from a surface to a coal layer, linking them and creating the operation centre of burning a coal layer and maintaining of conditions for coal transformation into a combustible gas directly in bowels and finally leading out a gas on the surface. All the technological operations on gasification of a coal layer are carried out from a surface without human force application in underground working, and as a result it can be ecologically profitable.

Today the interest to underground gasification of coal has sharply increased in all large coal-mining countries of the world. Essential research and practical works are carried out in China where ten industrial stations of coal underground gasification have been constructed, in Australia where the large enterprise of the given profile was built in 2003. The great attention to this technology is paid to such countries, as India, South Korea, the USA and many others.

In conclusion it must be highlighted that 2011 has already come. Oil and gas reserves are rapidly decreasing. It is the time for Kuzbass to work out new technologies on coal processing, making use of water coal fuel potential and introduce different new mining innovations.

(http://www.miningiq.com/technical-services)

Ex. 10. Summarize what is said on *developing technologies that improve the efficiency of coal, meet environmental challenges and increase the ways in which coal can be utilized.*

Listening

Ex. 11. Answer the questions before watching the video, after you watch the video you'll have to check your answers. The questions and the answers are given to you.

1. Coal mining is a …
a) complicated industry b) hazardous industry c) high tech industry
2. Miners work with the help of …
a) mining machinery b) shovels c) drills
3. Coal gives ….for the nation.
a) energy b) emissions c) heat
4. Nearly … % of energy in Great Britain is generated from coal.
a) 40 b) 80 c) 60
5. … million homes in Great Britain use coal for domestic heating.
a) 10 b) 8 c) 4
6. Huge powerful machines with the … horsepower work in British mines.
a) 100 b) 500 c) 400
7. Coal seams are on the depth of 400 feet and some seams are on …feet depth.
a) 500 b) 3000 c) 1000
8. A colliery can produce … million tons of coal a year.
a) 1 b) 4 c) 2

Ex. 12. Now watch the video again for the details. Describe technical characteristics of coal mining in Great Britain.

Speaking

Ex. 13. Discuss the following with your partner.

1. What are the main type of machines used for stripping overburden and excavating minerals?
2. What types of scrapers are widely used in open-cast mining?
3. Why are mechanical shovels replaced by hydraulically-operated excavators in many operations?
4. Why must mining personnel be highly skilled and well trained?
5. Why has computer knowledge become greatly valued in mining industry?

Ex. 14. Discuss the following questions with your partner.

- the process of extracting ore,
- highly productive equipment,
- more complete recovery,
- a plan line,
- coal recovery rate,
- a large rotating steel drum.

Ex. 15. Read and discuss the following with your partner.

Are mechanization and automation changing the way ore deposits are being mined? Industry needs more energy-efficient methods, systems and approaches. Do new technologies require a higher-skilled labour force and can reduce the exposure of miners to hazards?

Ex. 16. Work in pairs discussing mining methods and systems of a local mine you know about. Your partner will have to ask questions about the mine's technologies in operation. You must be ready to discuss most of the questions with your partner.

The discussion points:

- Water hydraulic systems,
- Design, adaptation and testing of new mining systems for operations,
- Non-explosive techniques for rock fragmentation,
- Explosive-Free Rock Breakage (EFRB) Initiative,
- Programmable controllers for underground systems and location of equipment,
- Wireless communications for automated control of stationary and mobile equipment.

Ex. 17. Debating.

Work in two groups. The first group is from Improved Mining Methods International, which is a new company in the mining sector offering Consultancy and Commissioning services to potential clients around the world. You are developing the pilot project "The Next Step in Mining Methods". The aim of a select group of specialists is to demonstrate how their knowledge and know-how will help generate an increase to clients' plants overall production.

The second group is from the regional mine. And you are hard observers.

Discuss the following: Improved Mining Methods offer a group of highly experienced Professionals including:

- Dredge and Wet Plant Coordinators,
- Mining, Mechanical and Structural Engineers,
- Tailing and Slime Coordinators,
- Mine and Maintenance Planners,
- Electrical and Mechanical Coordinators,
- Metallurgical and Process Technicians,
- Supervisor and Operator Trainers,
- Standard Operating Procedure Specialists.

Glossary

Tram	тележка; длина пробега вагонеток при маневровых работах
cutter-loader	очистной комбайн
Face	забой; лава
overburden	породы вскрыши; вскрыша
bench	уступ карьера; ступенчатая выемка
trench	углубление; шурф
stockpile	запас; резерв; отвал
waste	отходы
tackle	подъёмные приспособления
challenge	проблема; задача
customization	адаптирование к специфическим потребностям
state – of – art equipment	современное оборудование
wheeled scraper	колёсный самоходный скрепер
tailing	хвосты (пустая порода)
slime	тонкий шлам

Вернуться в оглавление

UNIT 10 MINING ROBOT TECHNOLOGY

Warming up

Ex. 1. How is the mining industry going to look like in the 22nd century? Do you have any ideas?

Lead –in

Ex. 2. What do you know about robotics and intelligent systems in mining? Answer the questions.

1. What are the benefits of using robotics and intelligent systems in mining?
2. Can the removal of staff from hazardous areas eliminate mining safety risks?
3. Can robotics make the mining operations more efficient?
4. Can robot technologies make measurements more accurate and repeatable ?
5. Can robot technologies assist in achieving optimum asset management for a mine site?

Ex. 3. Match the columns to read some useful facts about mining robot technologies.

Fragmentation analysis	Robotic mining vehicles plan routes, avoid obstacles, and follow the rules of the road. Safer, more efficient, less equipment damage.
Autonomous vehicles	Reports fragmentation statistics after a blast. Revises drill patterns to optimize rock size.
Autonomous loading system	Detects failing mechanical and vulcanized splices in conveyor belts. Prevents costly unscheduled belt downtime.
Conveyor belt inspection	Planning and control software and 3D sensors automate laborious loading tasks. Higher throughput per shift than the average operator.
Control center technologies	Powerful, multi-purpose platform assists miners and enables mining in hazardous areas and at deeper levels. Improves mine safety, efficiency and productivity.
High-mobility mining platform	Real-time, 3D teleoperation of equipment and vehicles. Plan missions and monitor mine operations from thousands of miles away.
Operator assist	Visual sensors help operators align machines and

	measure progress. Improves mine safety, efficiency and productivity.
Miner location system	GPS-independent, high-resolution imagery used to map mines safely and efficiently.
3d mapping	GPS-independent shoe inserts accurately compute miners' locations as they walk. No more guessing about miners' positions.

Ex. 4. a) Give definitions of the following words, if necessary consult English – English dictionary.

- Automated robotic mining –
- Driverless haulage trucks –
- Wireless communication –
- Radar and laser systems –
- Autonomous machine –
- Drum –
- Weathering –

b) Make the sentences of your own with the words from ex. 4. a)

Ex. 5. Insert the given words in the following sentences.

a) employment b) shearer machine c) involves d) extracting e) process f) employment g) require h) influence

1. Surface mining…..removing the overburden with heavy earth moving equipment, the coal, replacing the excavated soil.
2. Modern surface mining in as much a land reclamation process as it is a means of…..coal.
3. A…...is hauled mechanically back and force across the coal face, cutting and loading the coal onto a heavy chain conveyor which delivers it onto a belt conveyor and out of the mine.
4. Mining, in its broadest sense, the…..of extracting minerals from the earth's crust.
5. In the U.S., mining …declined through the late 1960s. By 1990, the coal mining …dropped to 147,000 workers and by 2000 to 80,000.

6. Mineral industry rock and waste and their management, …dedicated attention.

7. The process of rock disintegration by the direct …of local atmospheric conditions on the Earth's surface is called weathering.

Reading

Ex 6. a) Read the text and answer the questions after it.

The technology of automated robotic mining

Robotics is transforming mining around the world as a result of ongoing automation initiatives. Fully automated **robotic mining** encapsulates mines with smart drills for both production and material identification; precise automatic, remote controlled movement and positioning equipment; automated movement of vehicles such as **trucks**, and advanced management systems. Recent advances in intelligent software development have fuelled the development of functional robots and their role in mining. Robots offer improved safety, 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 to set up and operate the equipment remotely. This removes the operator from potentially dangerous zones on the **drill rig**, open cut or underground mine and increases overall efficiency of the mining operation.

Driverless 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 at a computer panel away from the mine site. Computer systems that provide information about the velocity and position of the vehicle can prevent accidents and increase the lifetime of the machine. Production loss can be minimized as breakdown frequency declines resulting in improved productivity and profitability in mining.

A significant challenge facing mining today is the increased global demand for minerals and metals while available resources are becoming harder to access due to location and harsh environments. Automation and

robotics can help to provide a solution by providing streamlined processes for **extracting ore**, while reducing the exposure of workers to health risks. New sensing technologies 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.

(http://www.miningiq.com/technical-services)

1. How is robotics transforming mining around the world?
2. How do robots improve safety, greater productivity and efficiency of mining operations?
3. Where has automated control technology been applied to?
4. What are the main functions of computer systems in mining operations?
5. What are driverless haulage trucks used for?
6. What is a significant challenge facing mining today?

b) Look at the text again and give Russian equivalents to the underlined word combinations. Consult Appendix 1 if necessary.

Ex. 7. Make up the right order of passages to read the text.

1. The Regolith Advanced Surface Systems Operations Robot (RASSOR) is an autonomous machine designed for lunar soil excavation.
2. NASA's new robot features a sturdy pair of diggers, and the reliability and strength to work all day, every day, for years.
3. The RASSOR looks like a small tank chassis with a drum at either end, each attached with arms. Because they are mounted on moving arms, the drums can act almost as legs, letting the robot step and climb over obstacles.
4. RASSOR uses digging bucket drums at each end of the robot's body that rotate in opposite directions, giving enough traction on one end to let the opposite side dig into the soil.
5. RASSOR is designed to easily make itself into a Z-shaped position to drop its soil collection into the hopper.
6. The robot can safely drive off the lander and right itself, flip itself over to get unstuck from fine soil, and lift the whole body off the ground to let its treads run smoothly to remove built up soil.

(http://phys.org/news/)

Ex. 8. Read the text “Drill of Dreams” to yourself, and then retell it to your neighbor as close to the text as you can. Your neighbor will then retell your story to his neighbor, etc. The last student will retell the story to the class.

Drill of Dreams

Kuzbass has a lot of excellent quality coal, but it is deep under the earth and hard to reach, and that is why it is hard to have profitable mines without new technologies. So, the "Hydro-Coal Institute," which is based in Novokuznetsk, developed a new kind of drill that allows to go deeper and to extract more coal.

Contrary to traditional drills, the new one doesn't slide on tracks, but is mounted on treads, making it much quicker and more mobile. Moreover, while drilling, it throws water at the drill-point, separating the coal from its by-products, which can often amount to roughly 30 percent of a seam.
That way, the coal doesn't need to be processed before being sent to customers, it can be used right away. It is also an ecological way of extracting coal: by-products stay under the earth. And the water runs in a closed circuit, thus, the river near the mine is not polluted: there are crayfish in this rivers a sure sign of clear waters for many Russians.

The new drill allows mines to extract coal for less cost than tradition methods used in Kuzbass. Thanks to this drill 50,000 tons of coal are extracted; a month with 200 people. Normally, to get as much coal, you would need 2,000 people.

(http://phys.org/news/)

Writing

Ex. 9. Translate the article from English into Russian and entitle it. See Appendix 2,3 for help.

Robots will be doing jobs like laying explosives, going underground after blasting to stabilize a mine roof or mining in areas where it is impossible for humans to work or even survive. Some existing examples of mining automation include. The world’s largest “robot”, a 3500 ton coal dragline featuring automated loading and unloading. A robot device for drilling and bolting mine roofs to stabilize them after blasting.

A pilotless burrowing machine for mining in flooded gravels and sands underground, where human operators cannot go.

A robotic drilling and blasting device for inducing controlled caving.

Robots must demonstrate efficiency gains or cost savings. The biggest robot of them all, the automated dragline swing has the potential to save the coal mining industry around $280 million a year by giving a four per cent efficiency gain. Major production trials of this robot are planned for later in the year 2000. Unlike their counterparts commonly found in the manufacturing industry, mining robots have to be smart. They need to sense their world, just like humans.

"Mining robots need sensors to measure the three dimensional structure of everything around them. As well as sight, robots must know where they are placed geographically within the minesite in real time and online," says Dr Corke. "CSIRO is developing vision systems for robots using cameras and laser devices to make maps of everything around the machine quickly and accurately, as it moves and works in its ever-changing environment," he says.

(http://phys.org/news/)

Ex. 10. Summarize what is said on *new technologies that will be used in mining in future.*

Listening

Ex. 11. Listen to the text and answer the questions?

1. What does the First Coal Corporation do?
2. Why are trenches excavated?
3. What equipment is used in mines of the corporation?
4. How mining is done in mines of the corporation?
5. What is done to minimize land reclamation?

Ex. 12. Watch the video once again and fill in the gaps.

First Coal Corporation

First Coal Corporation (F.C.C.) is a private company mining metallurgical coal resources in the north-east of British Columbia. The port of Prince Rupert with its riddle island deep water coal __ **1** ships coal

from a real line that runs to the community of Chetwynd and F.C.C. central self property.

Plants coal for an excess were to be build to load facility on a Rail Line, which carries __ **2** to the coast for offshore shipping. Trenches from 50-100 m. ____ **3** are excavated on the property, expose narrow steeply dipping or narrow vertical seams. High wall mining starts trenches with an each trench there are mined along strait. The any deeper car high wall mining system moves to mine each seam, the remover operated underground mining system has been modified to mine narrow steeply dipping or narrow vertical seams. High __ __ **4** uses a launch vertical that moves along the bench to mine coal using high tech guiding system to assure that remover operated continue with mining cutter head remains at a narrow __ __ **5** or vertical seam.

The system remains horizontally all the times with the cutter unit cutting a near vertical opening with in a seam. The operator ___ **6** the additional conveyor car, they are 9 m. long and specially designed to work in narrow seams from 1-3 m. wide. Each conveyor car is positioning on a deck on a launch vertical put the car in front of it as a push bar moves the train of cars and miner forward. A continuously operating valley conveyor on a long vertical fed from a mine by conveyors on cars start miles hole for transport. As more conveyor cars are ready the continuous mine moves forward to penetrate up to 300 m. The anchor created in each seam is about 4 m. high, with a weight equal to that a particular seam be mined. A 3 m. barrier of coal is left undisturbed above each anchor for support. The anchor system mines along strait for each direction from each bench within each trench. Trenches are excavated on 600 m.

This is the system of trenching of underground mine results in a significant reduction in surface disturbance compare to conventional open pit mining __ **7**, as material from excavated additional trenches is used to fill already mined trenches. Ongoing land reclamation after each __ **8** is complete, also minimize the storage of rock and washing may rejects above ground.

Test mining of first self-property is currently away, this is remain first coal a world leader in mining steeply dipping coal seams in a safe, coast effective, environmentally conscious and responsible manner.

Speaking

Ex. 13. Discuss the following with your partner.

- fully automated robotic,
- advances in intelligent software development,
- driverless haulage trucks,
- significant challenge in mining,
- digging bucket drums,
- machine designed for.

Ex. 14. Discuss the following questions with your partner.

1. Does Russia export or import coal?
2. Does Russia mine coal commercially?
3. Has coal in Russia many uses?
4. What are the most significant uses of coal in Russia?
5. Is Russia a coal producer or a coal consumer country or both?
6. What is “cost” and what is “price”?
7. Does Russia rely on domestic supplies of coal?
8. Is Russia the largest coal exporter in the world?

Ex. 15. Read and discuss the following with your partner.

Coal is a global industry, with coal mined commercially in over 50 countries and coal used in over 70. The most significant uses of coal are in generating electricity, steel production, cement manufacturing, other industrial processes and as a liquid fuel. Do you know how much coal is left in Russia and in the world? What will be the energy demand in Russia and in the world? What will be the investment in coal mining up to 2030?

Ex.16. Debating.

Work in two teams. The first team is from National Robotics Engineering Center, the second team is from Field Robotics Center, both are the part of the Robotics Institute. The task is to design, construct, and do test-drives of the robotics to underground mining.

This developed system measures the sump depth of a continuous mining machine without the use of external infrastructure. It also provides global heading information using a laser reference. This improves mining productivity and decreases health and safety hazards to mining workers.

Debating points:

- Autonomy and operator-assistance technologies optimize mining processes and mining equipment operation.
- Drills, miners and shearers are guided with laser precision for maximum extraction from the ore body.
- Operators can use autonomy and operator assistance to supervise mining equipment from a safe shelter, away from machines and hazardous areas.
- Consistent and never-tired robotics technologies can reduce human errors.
- Vision systems continuously monitor operations such as fragmentation, which lowers waste and reduces costs.
- Obstacle detection and avoidance systems help keep vehicles and machines from driving over debris that could cause tire or equipment damage.
- Autonomy and operator assistance allow equipment to operate properly within manufacturer specifications.
- Vision-based inspection systems detect failures in mining equipment (such as conveyor belts) before they occur.

Glossary

intelligent systems	интеллектуальные системы
robotics	робототехника
driverless haulage trucks	самоходная-откаточная машина
drum	барабан (напр. лебёдки)
weathering	Выветривание
shearer machine	врубовая машина для вертикальной зарубки
reclamation	исправление; улучшение
belt conveyor	ленточный конвейер
harsh environments	неблагоприятные условия окружающей среды
digging bucket	забирающий ковш

Вернуться в оглавление

Attachment 1

Basic terms and definitions

Mineral products	Полезное ископаемое	содержащееся в земной коре природное минеральное или органическое вещество, которое целесообразно добывать и использовать в народном хозяйстве или для личных потребностей, как в сыром виде, так и после соответствующей переработки. Полезные ископаемые бывают: горючие (энергоносители) и негорючие (руды).
Rock, earth's formations, rock formation	Горные породы	естественные минеральные образования, сформировавшиеся вследствие геологических процессов, более или менее постоянного состава и строения, слагающие земную кору и залегающие в ней в виде самостоятельных тел.
Ore; mineral	Руда	минеральное образование с содержанием полезных компонентов, обеспечивающим экономическую целесообразность их извлечения при современном уровне развития техники. Руды принято классифицировать по трем признакам: виду полезных компонентов, их количеству и характеру оруденения.
Mining waste, impurity	Порода (пустая порода)	минеральное образование, не являющееся объектом извлечения полезных компонентов при разработке месторождений (или минеральное соединение, не содержащее полезных компонентов или содержащее их слишком мало для рентабельной переработки).
Wallrock	Вмещающая порода	горная порода, окружающая рудное тело или включенная в него, которая либо совсем не содержит полезных компонентов, либо содержит их, но в количестве, недостаточном для экономического оправдания добычи и переработки.

Ore mass; lode stuff; rock bulk; rock mass	Рудная масса	называется смешанная при добыче руда с пустой породой.
Mined rock	Горная масса	называют всю выданную на поверхность руду и породу, как в смешанном виде, так и раздельно, сюда же входит и порода, полученная при проведении горных выработок.
Ore bed; ore deposit	Рудное месторождение	естественное скопление в земной коре полезного ископаемого, разработка которого экономически выгодна.
Combined mine; ore mine; excavating plant; mining operation	Рудник	предприятие по добыче руд.
Mine; stope	Горная выработка	сооружение (полость) в недрах земли, созданное в результате ведения горных работ.
Permanent roadway	Капитальные выработки	выработки, проведенные на стадии строительства рудника за счет выделенных на это строительство средств, сохраняемые в течение всего срока службы рудника или хотя бы одного его горизонта.
Shaft	Ствол	вертикальная или наклонная горная выработка, имеющая непосредственный выход на поверхность и предназначенная для обслуживания горных работ: подъема полезного ископаемого и пустой породы, спуска и подъема людей, материалов и оборудования, подачи свежего воздуха и выдачи загрязненного, спуска закладочных материалов, откачки воды и др.
Blind pit; staple; blind shaft;	Слепой ствол	вертикальная или наклонная горная выработка, не имеющая непосредственного выхода на поверхность и предназначенная для обслуживания подземных работ: подъема полезного ископаемого и пустой породы, спуска и подъема людей, материалов и оборудования, подачи свежего воздуха и выдачи загрязненного,

		спуска закладочных материалов, откачки воды и др.
Gallery	Штольня	горизонтальная горная выработка, пройденная к месторождению с поверхности и предназначенная для обслуживания подземных горных работ: выдачи полезного ископаемого и пустой породы на поверхность, перемещения людей, материалов и оборудования, подачи свежего воздуха и выдачи загрязненного, подачи закладочных материалов, откачки воды и др. Штольни проходят в гористой местности. Направление штольни по отношению к простиранию рудного тела может быть любым.
Level	Горизонт	совокупность выработок, расположенных в одной горизонтальной плоскости и предназначенных для ведения горных работ.
Lift	Этаж	часть шахтного поля, ограниченная по падению откаточным и вентиляционным горизонтами, по простиранию – границами шахтного поля.
Block	Блок	часть этажа, ограниченная восстающими или условными границами. Блок – выемочный участок в пределах этажа, для отработки которого применена в полном комплексе та или иная система разработки.
Sublevel	Панель	часть шахтного поля, образующаяся в результате его деления (подготовки) главными откаточными и вентиляционными штреками.
Crossdrift	Квершлаг	горизонтальная подземная горная выработка, не имеющая непосредственного выхода на поверхность, проведенная по породам вкрест (перпендикулярно) простиранию месторождения от ствола до рудной залежи. Используется для транспорта, вентиляции, передвижения людей, водоотлива, прокладки кабелей, труб и

		линий связи.
Coal heading	Штрек	горизонтальная подземная горная выработка, не имеющая непосредственного выхода на поверхность, проведенная по простиранию (параллельно) наклонно залегающего рудного тела или в любом направлении при горизонтальном его залегании. Штрек служит для транспортирования грузов, передвижения людей, вентиляции. Штреки, проводимые по руде, называют рудными, а по вмещающим породам – полевыми.
Crossdrift; ort	Орт	горизонтальная подземная горная выработка, не имеющая непосредственного выхода на поверхность и проведенная вкрест простирания рудного тела по руде. Если орт соединяется с полевым штреком, то часть его может проходиться по породам. Понятие «орт» имеет смысл только в крутых и наклонных залежах, так как в горизонтальных залежах простирания просто не существует, и в этих условиях (как уже отмечалось выше) горизонтальную выработку любого направления называют штреком.
Millhole; bing hole; draw raise; mill hole; milling hole;	Рудоспуск	вертикальная или наклонная горная выработка, или ограниченная крепью часть выработанного пространства для перепуска рудной массы под действием собственного веса.
Slope	Уклон	наклонная подземная выработка, не имеющая непосредственного выхода на поверхность и предназначенная для подъема руды и вспомогательных нужд.
Boring; delve; pit-hole	Шурф	неглубокая вертикальная горная выработка, пройденная с поверхности и предназначенная для доразведки, проветривания (запасное), подъема.
Spiral ramp	Спиральный съезд (заезд)	наклонная горная выработка (может иметь непосредственный выход на

		поверхность), предназначенная для заезда бурового, доставочного и другого горного оборудования на горизонты, доставки крупногабаритных грузов, подъема рудной массы на поверхность при помощи самоходного оборудования, а также для вентиляции.
Tunneling operation	Туннельная работа; проходка	(проведение) горных выработок совокупность производственных процессов, осуществляемых для образования горных выработок.
Sewerage	Канализация	канализационная система состоит из подземных трубопроводов, уложенных с уклоном для обеспечения самотека. Отходящие от каждой установки линии объединяются в коллекторы, а из них стоки поступают в пруды-накопители, в которых происходит первичный отстой от механических примесей.
Blasting	Подрывные или взрывные работы	совокупность производственных процессов по отделению скальных горных пород от массива с помощью взрыва. При проведении буровзрывных работ производится планирование буровых работ (виды скважин, их диаметр, расстояние между скважинами, глубина и т. д.), подготовка к взрыву (заряжание взрывчатых веществ, забойка скважин, монтирование взрывной сети и т. д.), инициирование и произведение взрыва.
Rock mechanics	Механика горных пород	наука о механических свойствах породных массивов и механических процессах, происходящих в них при ведении горных работ. Наука находится на стыке геомеханики и горной науки и имеет главной целью рациональное управление горным давлением.
Surveying	Геологическая съёмка; топографическая съёмка	совокупность работ по всестороннему изучению геологического строения территории и составлению её геологической карты. Различают маршрутную, площадную, структурно-

		геологическую сьемки. При геологосъёмочных работах применяют геофизические и геохимические методы исследования, аэрометоды, материалы фотосъёмок земли из космоса и данные картировочных буровых скважин и поверхностных горных выработок.
Coal output	Добыча угля	включает добычу (обогащение) и переработку (брикетирование) бурого и каменного угля. Способ добычи угля зависит от глубины его залегания. Разработка ведется открытым способом, если глубина залегания угольного пласта не превышает 100 метров. Нередки и такие случаи, когда при все большем углублении угольного карьера далее выгодно вести разработку угольного месторождения подземным способом.
Coking gas	Газ коксования	разложение при высокой температуре без доступа воздуха твердых и жидких горючих ископаемых с образованием летучих веществ и твердого остатка – кокса.
Ash content	Содержание золы; зольность	отношение массы негорючего остатка (золы), полученной после выжигания горючей части топлива, к массе исходного топлива.
Brown coal	Бурый уголь	горючее ископаемое растительного происхождения, представляющее собой переходную форму от торфа к каменному углю.
Lignite	Лигнит	ископаемая, слабоуглефицированная древесина бурого цвета, сохранившая строение растительных тканей и по внешнему виду сходная с неизменённой древесиной. Лигнитом называют также бурый уголь, содержащий обильные включения плохо разложившихся древесных остатков.
Bituminous coal	Битуминозный уголь	геологические отложения черного цвета, богатые углеродом, которые образовались из остатков ископаемых растений. В каменноугольный и

		третичный периоды болотная растительность превратилась в торфяные поля, которые постепенно заносились осадочными материалами, и под воздействием возросшего давления и температуры образовался лигнит (бурый уголь), затем битуминозный уголь, и наконец, если происходило достаточное увеличение температуры, антрацит.
Anthracite	Антрацит	ископаемый уголь наиб. высокой степени углефикации (метаморфизма). Имеет серовато-черный или черно-серый цвет с металлическим блеском. Анизотропен. В пористой структуре преобладают микропоры с объемом 0,072-0,075 см3/г; общий объем пор ок. 0,1 см3/г. Характеризуется наибольшей твердостью в ряду твердых горючих ископаемых (2,0-2,5 по минералогической шкале) и электропроводностью, высокой плотностью (1,5-1,7 г/см3).
Coalification	Углефикация	увеличение содержания углерода и уменьшение примеси природных газов и влаги.

Вернуться в оглавление

Attachment 2

Термины и особенности их перевода

Термин – это основная единица науки, специальных отраслей знаний и сфер деятельности человека, призванная номинировать объекты и процессы и одновременно служить средством познания окружающего мира.

Для того, чтобы правильно определить выражаемые термином понятия, нужно обладать знаниями той области науки и техники, к которой относится данная терминология. Необходимо заметить, что для правильного понимания и перевода терминов необходимо изучить морфологическое строение терминов.

Выделяют следующие морфологические структуры терминов:

- простые: well – скважина, collapse – обвал, mine – шахта, anthracite - антрацит;
- сложные:, roadway – штрек, outcrop – выход породы на поверхность, coalbed – угольный пласт;
- термины-словосочетания: underground method - подземный метод добычи, main haulage roadway – основной откаточный штрек, shallow mine shaft – неглубокий шахтный ствол.

Термины-словосочетания делятся на:

- термины - словосочетания, оба компонента которых являются словами специального словаря. Они самостоятельны и могут употребляться вне данного сочетания, сохраняя присущие каждому из них в отдельности значение: shortwall mining – разработка короткими забоями, blast mining – разработка, при помощи взрыва, rock face – плоскость забоя или горной выработки, ventilation fan – искусственное проветривание.
- термин - словосочетание, в котором только один из компонентов является техническим термином, а второй относится к словам общеупотребительной лексики. Компонентами этого типа могут быть 2 существительных или прилагательное + существительное. Оба компонента являются самостоятельными терминами: dust explosion – взрыв пыли, poor ventilation – слабое проветривание, roof fall – обвал кровли.

- слова - термины, оба компонента которых представляют собой слова общеупотребительной лексики, и только их сочетание является термином: surface operation – открытые горные работы, ore body – рудное тело, hard rock – скальная порода, mineral vein – жила полезного ископаемого.

В настоящее время существует около десяти способов перевода терминов. Наиболее распространены следующие способы:

1. Оптимальным способом перевода служит выявление в языке перевода (ЯП) эквивалента термина языка оригинала (ЯО). Этот способ применяется тогда, когда страны, в которых распространены ЯО и ЯП, находятся на одном и том же уровне развития.
2. Новый термин в ЯП может быть создан путем придания существующему в этом языке слову нового значения под воздействием термина ЯО.
3. Калькирование – перевод сложных по структуре лексических единиц ЯО с применением языковых средств ЯП. Существует способ перевода при помощи семантической кальки, когда структуры лексических единиц в обоих языках совпадают, а когда структура лексической единицы заимствуется при переводе вместе с этой единицей, мы имеем дело со структурной калькой.
4. Когда в процессе перевода заимствуется и семантика, и структура и форма термина, мы имеем дело с заимствованием.
5. В ряде случаев термин может переводиться описательной конструкцией. Этот способ применяется для перевода безэквивалентных терминов.

Следует помнить о том, что перевод терминов-словосочетаний следует начинать с перевода ядерного компонента, т.е. последовательно переводить каждую смысловую группу, чаще всего справа налево, например:

Well placement scheme $\rightarrow$ scheme – схема $\rightarrow$ well placement – схема расположения скважин.

При переводе терминов следует учитывать, что многие термины многозначны, т. е. имеют различные значения не только в разных областях науки и техники, но даже в одной и той же области. Примером тому может послужить терминология горного дела. Одно и то же понятие иногда обозначается разными терминами, а один и

тот же термин используется в разных значениях. Поэтому при переводе текстов необходимо осмыслить, правильно истолковать термин и правильно подобрать русский эквивалент. Например, *mine* может означать «шахта», «горная выработка», этот же термин в этом же подъязыке может означать «рудник, копь, подземная выработка, залежь, пласт».

Многие английские термины в любом контексте соответствуют определённым русским терминам, и основная масса научно-технической терминологии не входит в состав общелитературного языка, оставаясь понятной лишь специалистам данной отрасли знания. Тем не менее, роль контекста чрезвычайно велика, так как значительное количество терминов – это общеупотребительные английские слова, взятые в специальном значении. Контекст помогает выявить следующее: а) употреблено ли слово в своём обычном значении или в специальном, б) в каком из своих значений употреблён многозначный термин в данном конкретном случае.

Особое внимание следует уделять переводу терминов–аббревиатур:

1. Перевод английского сокращения осуществляется эквивалентным русским сокращением CAD (Computer-Aided Design) – САПР (система автоматизированного проектирования); RCS (Radar Cross Section) – ЭПР – (эффективная площадь рассеивания воздушной цели); VLSI (Very Large Scale Integration) – СБИС (сверхбольшая интегральная схема).

2. Передача английского сокращения методом транслитерации, например: ARTRAC (Advanced Real-Time Range Control) – перспективная система управления «Артрак» с автоматическим преобразованием в реальном масштабе времени получаемых при радиосопровождении сигналов FORTRAN (Formula Translation) – процедурный алгоритмический язык «Фортран»

3. Методом прямого заимствования на русский язык могут переводиться марки летательных аппаратов (B737-200, ATR-42, DC-8-54), авиационных двигателей (RTM322, TRE331-14, JT15D-4), пилотажно-навигационного оборудования (AN/AC182, LRN500, ASR360).

4. Передача английского сокращения методом транскрипции, например: EAGLE (Elevation Angle Guidance Landing Equipment) –

глиссадный посадочный радиомаяк «Игл» с управлением по углу места.

5. Передача английского сокращения описательным методом. Описательный перевод должен полностью выявлять техническую сущность сокращения, например: WIDE (Wide-angle Infinity Display Equipment) – предназначенная для наземных тренажеров широкоугольная система предъявления поступающей от ЭВМ визуальной информации воздушной обстановке.

Особого внимания заслуживают термины, заимствованные из иностранных языков или искусственно созданные учеными на базе, главным образом, латинского, греческого языков, по мере развития науки и техники и появления новых понятий.

Свыше 50 % терминов, входящих в состав современного языка научно-технического общения, являются результатом заимствований из латинского, греческого и французского языков, происшедших в течение последних 200 - 300 лет. Эволюция ряда современных терминов может составить предмет увлекательных исследований, дающих возможность более глубоко понять их смысл, а также характер терминообразующих процессов, приведших к их появлению.

Вернуться в оглавление

Attachment 3

Терминологическая группа и особенности ее перевода

Термин может состоять из одного базового слова (БС) или представлять собой терминологическую группу. В английском языке терминологическая группа состоит из БС (ядро группы), одного или нескольких левых определений (ЛО) и одного или нескольких предложных определений (ПО), которые уточняют и модифицируют смысл термина. В общем случае структурная схема терминологической группы может быть представлена в следующем виде:

$ЛО_n \leftarrow \ldots \leftarrow ЛО_2 \leftarrow ЛО_1 \leftarrow БС \rightarrow ПО$

Рассмотрим, например, строение терминологической группы petroleum – based mineral oils purified to “transformer oil grade”:

ЛО	БС	ПО

oils

масла

mineral oils

минеральные ***масла***

petroleum – based mineral oils

минеральные ***масла*** *на основе нефти*

petroleum – based mineral oils purified to “transformer oil grade”

минеральные ***масла*** *на основе нефти, очищенные до степени «трансформаторного масла»*

Приведённый пример иллюстрирует два факта, важных с точки зрения перевода термина. Во-первых, в отличие от англоязычной практики, в русском языке базовое слово обычно занимает место ближе к началу терминологической группы. Во-вторых, нетрудно видеть, что любой член терминологической группы (ЛО, ПО, БС) сам может являться терминологической группой. В приведённом примере слово «oils» является ядром терминологической группы «mineral oils». Терминологическая группа «минеральное масло» является

устойчивым словосочетанием, как в русском, так и в английском языке. Поэтому при дальнейшем усложнении терминологической группы сама терминологическая группа «mineral oils» служит новым базовым словом, к которому относятся последующие уточняющие определения.

Исходя из этого, перевод сложной терминологической группы представляет собой ряд операций, выполняемых в следующей последовательности:

1. Идентификация терминологической группы, которая заключается в выявлении базового слова и определении границ терминологической группы справа и слева.
2. Перевод базового слова как первичного значащего элемента терминологической группы. При этом базовое слово в русском переводе ставится в начало терминологической группы.
3. Последовательный перевод левых уточняющих определений, начиная с левого определения, ближайшего к базовому слову. Количество уточняющих определений иногда может быть намного больше десяти. В этом случае, для того чтобы смысл терминологической группы не размывался, однотипные уточняющие определения, то есть отвечающие на один и тот же вопрос, следует сгруппировать вместе.
4. Перевод предложных определений применительно ко всей уже переведённой группе. Таким образом, перевод левых определений терминологической группы англоязычной статьи производится в порядке её строительства, т.е. справа налево, а предложные определения при переводе сохраняют свое положение.

Вернуться в оглавление

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KEYS

Unit 1

Listening

Script:

12 things I wish my students knew

Hi, I'm Raymond Best, I've been teaching in school system for 30 years, and I've seen pretty much everything. I've seen students get almost 100 % and I've seen other students repeating the course and still not get through.

I remember I was giving some notes on a blackboard and one student wasn't taking notes and I asked him why. He answered that he had taken this course twice before and had known it well. So, I've seen pretty much everything. But I do believe that almost any student can get top marks. Any student! It doesn't matter what your background is, what your experience has been. If you do the right things, sometimes very simple things, they will allow you to get 90 %.

The first thing – when it comes time to study, all destructions are removed: the TV is off, all music is put away. The researches tell us very clearly – the only kind of music that you can have at your background, is classical music.

First thing first – when you go to a job, you work for your employer and you give the best you've got. They pay you for the hours you are working. I would like you to think that your classroom time and your study time is your job. It is an investment in your future. The better you do at school the better you'll have at your job. Think about it as about your job.

Suppose you did very well in a course, you feel yourself better, people like what you've done, your parents will be happy. There will be a cycle of success around you and there is now down side in getting good marks.

A couple of tips: suppose you are starting to work. And here some psychological tips can help you. You can tell yourself – I can study for 5 minutes and do my best and when you start, you keep going.

Another thing you can do is always make a list. Sit down and write that you have to read these pages and follow through a list.

Here is one more little tip that helps. The research tells us that at the begging of a study session you can remember more. So why not trying to study for 20 minutes, make a very short break for a couple of minutes and study for 20 minutes. You will have 6 picks when your power maximized.

First thing first – you make your study time your priority, all destructions are removed. It is an investment in your future.

Unit 2

Listening

Script:

Global engineering excellence study

Engineers are educated on every continent around the world. They are trained in different fields according to various curriculums in different universities?

What do engineers actually do in different countries?

What qualification do they have?

How does the society view them?

What do they contribute to the national economy?

What is an engineer?

Will these people be able to work together as engineers in future?

Will they recognize global demands and be capable to develop common solutions?

Under the direction of technical University in Germany the project has been developing since 2005. The major question was: "What is global engineering and what is a profile of a global engineer"? Furthermore we discussed whether the traditions of the participating nations allow to the development of global engineering curriculum.

"It is of major importance for us to know what the qualifications of students in future are, and there for this project is of a special importance for us to define what we will change in our curricular to enhance the curricular and qualify the students in the right way".

"If you look at today's world and the same will be for the future, not only industry is acting globally, the whole society has changed, and

therefore it is of major importance to qualify our young students to be able to act in such international environment".

The world today and tomorrow – economic globalization makes necessary a storm across national network in companies with worldwide cooperation. As one of the world's major supplies to the automotive industry continental and global engineers alter corporate divisions. And this global cooperation with every continent the ability of the engineers to communicate with one another is a fact of company importance.

Unit 3

Listening

Script:

Bucket Wheel Excavator

Germany's rand land district is famous for its natural resources and the worse over them. Here the immense bucket wheel excavator is supreme. This is one of the biggest movable machines on land. If you could put one next to the statue of Liberty, you probably couldn't, it would compare like this.

If you need one few back yard it will set you 100 million dollars. It will take 2 years to make the parts and another 2 years to build it onside, but it should last you good 40 years of nearly constant digging.

Bucket wheel excavators are coal mining machines. Germany rand land is abandoned with underground layers or seams of brownish lignite coal. First, the top layers of earth, the overburden are put away. Here you can clearly see the dark coal seam under the sand of overburden.

Rolling on its 12 massive rollers the excavator couldn't bit over one man pushing a baby stroller, but it digs fast, faster than anything ever build, because it digs and dumps in uninterrupted process.

Such a big machine is controlled by only two persons. These 2 persons remove more than 200 000 cubic miters of material over 3 shifts each day. We would need more than 40 000 people with shovels to replace the excavator and to make the same amount of material each day as the excavator does.

Unit 4

Listening

Script:

Innovating Engineering Education

Our world is a precipitous motion, for moving faster, breaking boundaries, reaching higher, but how hard is this momentum, how is engineering innovation? Travel to York of innovation back far enough and you find students taking the first steps to their discoveries.

For over 50 years the Department of Freshmen Engineering has inspired generation of students to think big and small. From historic first to pioneering programs and services this innovative spirit defines to produce engineering education. It is our calling and for half a century our reward has been eliminated to an engineer of better world.

Great innovations often have humble beginnings. Our beginnings are on the 3d floor of Dunken high voltage laboratory. There in 1953 the first in the country department of Freshmen Engineering was produced. Once used for high voltage research the building quickly began a center of engineering education. The founder, Albert Spalding, established rules for admission to register freshmen engineering students advise them and prepare them to a professional school.

In 1950s new classrooms and labs were built. President spent 100 million dollars for facility plan to realize campus. Freshmen Engineering researches broke new ground as well. By studding the fact that predicted students' success faculty advisers develop the studding plan for each student. The faculty has specific card for freshmen, students can chose the engineering disciplines? In addition discovery service is very much emphasized. The department is unique and gives rise of very high retention. High retention of students is due import to exception advising on 1 year experience. Freshmen Engineering academic advisors are noted for dedication, students can visit any advisor, classman or professor. Consultants are always ready to guide you through your experience. They make the environment very personable to every student.

Freshmen Engineering Department continues to build special programs. In 1958 we established the first program for advanced students

and students who need special help, and the program for women. It was high time for change.

In the early 50s women who came in engineering really didn't know what was expected from them. The equipment was heavy and women couldn't do the work. And a lot of women had to leave engineering.

New changes in curriculum attracted more women. In 1969 Freshmen Engineering Department started first nation engineering program for women and today produces more women with bachelor degree than any school. In 1974 the Department started minority engineering program.

Unit 5

Listening

On the discovery of an ancient coal mine near Bury, Lancashire in 1976

In 1976 the M66 Motorway had been constructed of Rozender valley pass Lancashire town valley. Flowing down from the east side there was the stream needed to be diverted into culvert in order to take it on the new motorway.

The driver of mechanical digger was shocked when suddenly the machine fell into a hole. Fortunately he wasn't injured but beneath a digger there was a hole that no one had predicted.

So, what was this mysterious hole? It soon became obvious that the digger broke in to an old coal mine. Here was the coal mine that was directly under the stream course just 40 inches below.

The thought that anyone can work in this mine at all is incredible. Emitted beneath the hard sandstone roof of a mine was a thin layer of black coal just 2 feet 8 inches in thickness. And that was the old mine.

But let us take a closer look at the photo record. On the right is the coal. We may wonder why the old miners had left such good coal behind. It was common practice to leave the coal as a roof support as in this case. This is the small ledge just 6 inches wide beneath the coal. This is known as the seat Earth – it is fossil soil in which 345 million years ago grew trees. On the left of the photograph there is the word "gob". Gob is a mine stone area where the coal is extracted.

Taken from a report about employment of children in mining in 1842 the picture shows the working conditions of that time. In all coal mines it was even worse. The miners had to lie to take the coal out.

What did they use to take the coal outside a mine? They certainly used sledges with wheels that were moved on the rails. These sledges were found later near by a miner and the picture gives the idea what they were like.

Did women and children work in an old mine? We just don't know. But it is likely they did. The wagons known as tubes would have to be pushed along the main haulage road way to the day light, they were driven by a belt or chain so common during the Industrial Revolution.

And finally how did they see to work? They used candles. Mines were risky places and many people were killed by roof fall or explosions. The risk of the explosion was very real because of the methane gas. When methane was mixed with the right percent of air, the slightest spark of naked flam would cause a disaster explosion. The entrance to a mine must be closed, probably it happened with the mine beneath the motorway.

Unit 6

Listening

Script:

In the community in which we live a prompt such as the impact of using coal to make electricity has only environment may not seem the list of relevant for everyday lives. My partner and I have recently learnt during the researching and communication with people associated with this business and this problem may in fact affect us directly.

Coal is a non-renewable energy resource because it can't be replenished by human tempering; the ways of regenerating coal include: mining coal, transporting it to power plants and burning it. Coal is a cheap and abundant source of energy; it emits more carbon dioxide into the atmosphere than any other fossil fuel.

Pennsylvania has a long history of coal mining. Pennsylvania has been among the highest coal produced areas of the world. Although coal is so badly environment it is nearly impossible to the country to stop using it.

According to EPC protocol 50 % of energy of the United States comes from coal. When we heard this statistics we were shocked. Hearing this motivates us to do the research how coal is used in our country.

After decision to do the research we discovered Energy Company called “Cancelled Energy Inc.”. This is one of the largest coal companies in Pennsylvania. We came into the communication with the receptionist from the company and she guided us to the research and development one page which shows the different ways of their shy to make energy clearer.

One of the things we found interesting was Crendlege Multiple Level Control Project. This project is a control system build up to a small power plant as a test to see if it effectively reduces harmful gas emissions into the air. Outside this one page we discovered another way to use coal in more clean way. This is coal gasification – it is a series of reactions that eventually allows us to prevent any harmful impurities such as carbon dioxide into the atmosphere.

You may wonder why we should care about this and how directly it affects us, emissions from using coal are dangerous for our health in greatly contribute to the climate change and global warming.

Another problem with the harmful gases release from using coal is that many people who live in close proximity to a coal mine may be injecting by harmful radiation because coal ash is radioactive.

In addition to the use of coal is the fact that mining coal is the most hazardous profession.

In spite of the fact that this pretty killer is in the dark we believe that exposing people to this problem will push them to the valuable and safety coal using since we are likely using coal forever and steps are taken in the right direction.

Unit 7

Listening

Script:

What is coal?

Coal is a rock that burns. There are fossil fuels: oil, natural gas and coal. It forms from fossil leavings remained. So, plants become fossilized and the organic matter turns into fuel and coal is one of that types. For

example, these ferns were settled down in a mud 300 million years ago and these plants become fossils.

Here is the example how coal was formed. More than 300 m. years ago trees grew in swamping forests that covered many parts of the Earth. In Kentucky these swamps covered what is now the eastern and western part of the state as well as in many surrounding states. The plants grew and observed the sun energy. As the plants died and fell in to the swamp and still other trees grew at their place. During the years a thick layer of dead plants accumulated at the bottom of a swamp to form spongy brownish material called peat.

This is a piece of peat, it is very soft and crumbling and we can see some parts of plant remained in the peat.

As see levels changed and rivers flooded sediment covered the peat. As layer upon layer of sand, mud and clay up of the peat, it was compressed by pressure and heat, sneezing out most of the water. Layers of peat were cooked until after millions of years they harden into what we call coal.

The black material has a lot of carbon, it is organic material and when we heat that black material the carbon turns black.

There are 4 major types of coal classified by hardness: the harder the coal the less moisture it contains and the harder it burns. This is sub-bituminous coal, it is brown and shiny. This is bituminous coal – it is very very shining, and the last stage for coal is anthracite coal, it is very shining and hard. The hardness comes from pressure.

Unit 8

Listening

Script:

The surface of the Earth is made up of rocks which contain over 2 000 different kinds of minerals.

Many of these aren’t really seen because they are very deep within the Earth.

The hardness of these rocks and minerals is responsible in part for the Earth’s landscape.

Mountain reaches are held up by rocks formations which are composed of hard, resistant minerals.

Valleys and lowlands exist with the minerals in a rock which are easily broken down and washed away.

This doesn't mean that all mountains contain the same minerals, because there are so many varieties of hard and soft minerals and also, because some minerals which are joinable in one climate are easily decomposed in another.

The soils which support all vegetation are composed of mineral fragments weathered from once solid rock.

These mineral fragments and the kinds of minerals in the hard rock beneath the soil cover determine the thickness and richness of the soil.

The world of men made articles depends on the elements obtainable from minerals, for example both the cheapest bottle and the most expansive camera are made of the elements silicon and oxygen combined in the mineral cores.

The metals of cars, steel buildings, manufacture machinery these are all obtained through the efforts of men exploring, sampling, testing and finally mining ore coring in order to extract milling ores from the otherwise useless rock.

Every step of our modern existence is added by knowledge and development about mineral resources.

Unit 9

Listening

Script:

Coal mining today is a high tech industry, light years removed from the traditional picks and shovels in the strip or history text books. Mine work exceeded to skilled mechanical mining assisted by removed automated control which benefits for efficiency and safety.

There are more than a hundred collieries operating in British coal pills producing energy for the nation and jobs for more than hundred thousand miners. Nearly 80 % of the energy we used is generated from British coal and 4 million homes use solid fuel for domestic heating. So you could say – coal puts the great in Britain.

The coal mine starts here in the lamp camera; everyone has their hardhat and safety boots and a cap lamp for self-rescue. Coal seams are at a depth of 300 feet others are at a depth of 3000 feet. You can get there by ridding on the shaft in a cage just like a lift in a large store. For the miner and for a visitor the shifting to a coal seam is only just begun as coal seam is advanced further away from the shaft. Today they can be more than 10 miles away from the shaft bottom and men have to travel underground on the shaft locomotives.

Huge powerful machines with the force as much as 500 horse force cut coal in Britain highly mechanized mines. The shearers as they are called excavate coal slices as they are moving in coal faces taking strip after strip of black fossil fuel. In the capital of coal industry it can take up to 5 million pounds to support to equip 100-300 meter face, each colliery may have 3 or 4 coal faces. A single colliery can turn out 2 million tons of coal a year and after serving annual energy needs small a …

Visitors can't help but be impressed by the coal cutting machine which helps to keep wheels of British industry turning. There have gone the days of picks and shovel, coal mining is a high tech industry and it is microchip and computer age.

Unit 10

Listening

Script:

First Coal Corporation

First Coal Corporation (F.C.C.) is a private company mining metallurgical coal resources in the north-east of British Columbia. The port of Prince Rupert with its riddle island deep water coal ships coal from a real line that runs to the community of Chetwynd and F.C.C. central self property.

Plants coal for an excess were to be build to load facility on a Rail Line, which carries coal to the coast for offshore shipping. Trenches from 50-100 m. deep are excavated on the property, expose narrow steeply dipping or narrow vertical seams. High wall mining starts trenches with an each trench there are mined along strait. Any deeper car high wall mining system moves to mine each seam, the remover operated underground

mining system has been modified to mine narrow steeply dipping or narrow vertical seams. High wall mining uses a launch vertical that moves along the bench to mine coal using high tech guiding system to assure that remover operated continue with mining cutter head remains at a narrow steeply dipping or vertical seam.

The system remains horizontal all the times with the cutter unit cutting a near vertical opening with in a seam. The operator supervises the additional conveyor cars; they are 9 m. long and specially designed to work in narrow seams from 1-3 m. wide. Each conveyor car is positioning on a deck on a launch vertical put the car in front of it as a push bar moves the train of cars and miner forward. A continuously operating valley conveyor on a long vertical fed from a mine by conveyors on cars start miles hole for transport. As more conveyor cars are ready the continuous mine moves forward to penetrate up to 300 m. The anchor created in each seam is about 4 m. high, with a weight equal to that a particular seam be mined. A 3 m. barrier of coal is left undisturbed above each anchor for support. The anchor system mines along strait for each direction from each bench within each trench. Trenches are excavated on 600 m.

This is the system of trenching of underground mine results in a significant reduction in surface disturbance compare to conventional open pit mining method, as material from excavated additional trenches is used to fill already mined trenches. Ongoing land reclamation after each trench is complete, also minimize the storage of rock and washing may rejects above ground.

Test mining of first self-property is currently away, this is remain first coal a world leader in mining steeply dipping coal seams in a safe, coast effective, environmentally conscious and responsible manner.

Вернуться в оглавление