МИНИСТЕРСТВО СЕЛЬСКОГО ХОЗЯЙСТВА
И ПРОДОВОЛЬСТВИЯ РЕСПУБЛИКИ БЕЛАРУСЬ

ГЛАВНОЕ УПРАВЛЕНИЕ ОБРАЗОВАНИЯ,
НАУКИ И КАДРОВОЙ ПОЛИТИКИ

Учреждение образования
«БЕЛОРУССКАЯ ГОСУДАРСТВЕННАЯ
ОРДЕНОВ ОКТЯБРЬСКОЙ РЕВОЛЮЦИИ
И ТРУДОВОГО КРАСНОГО ЗНАМЕНИ
СЕЛЬСКОХОЗЯЙСТВЕННАЯ АКАДЕМИЯ»

И. П. Макаренко

# АНГЛИЙСКИЙ ЯЗЫК

# EARTHMOVING AND LAND RECLAMATION EQUIPMENT

*Рекомендовано учебно-методическим объединением по образованию в области сельского хозяйства в качестве учебно-методического пособия для студентов учреждений образования, обеспечивающих получение общего высшего образования по специальности 6-05-0811-03 Мелиорация и водное хозяйство*

Горки
БГСХА
2023

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*по социально-гуманитарным и лингвистическим дисциплинам*
*24.05.2023 (протокол № 9)*
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Приведены тексты для чтения по специальности, которые сопровождаются упражнениями, обеспечивающими овладение профессиональной лексикой, способствующими углубленному пониманию прочитанного и интерпретации полученных данных.

Для студентов учреждений образования, обеспечивающих получение общего высшего образования по специальности 6-05-0811-03 Мелиорация и водное хозяйство.

**УДК 811.111(075.8)**
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**ISBN 978-985-882-385-6**

## ВВЕДЕНИЕ

Настоящее учебно-методическое пособие предназначено для студентов 1-го курса, обучающихся по специальности 6-05-0811-03 Мелиорация и водное хозяйство.

Цель пособия – обеспечить овладение студентами основными терминами, сформировать у студентов умения вдумчивого чтения текстов по специальности с полным извлечением и интерпретацией информации, а также развить умения быстрого чтения, направленного на поиск нужных данных и составление общего представления о прочитанном. Сопутствующая задача – совершенствование навыков устной и письменной речи.

В основу пособия положена система текстов, взятых из аутентичных источников. Пособие включает 8 разделов. Каждый раздел включает два текста – А и Б, снабженных словарем и специально разработанными упражнениями.

Предтекстовые упражнения направлены на смысловую группировку новых терминов, а также прогнозирование содержания текста и поиск определенной информации. Далее предусмотрено изучающее чтение текста А с целью полного и точного понимания представленных сведений. Текстовые упражнения предполагают установление связи между фактами текста, заполнение диаграмм, обозначение рисунков с опорой на текст, контролируют понимание прочитанного на уровне значений и смысла.

Работа с текстом В предусматривает поиск различной информации, ответы на вопросы, касающиеся основного содержания, оценку прочитанного.

Послетекстовые упражнения ориентированы на совершенствование навыков письменной и устной речи на основе текстов и дополнительной, самостоятельно найденной информации.

В конце пособия приводится общий расширенный алфавитный словарь, облегчающий работу студентов.

Разработанные задания могут использоваться как на аудиторных занятиях, так и внеаудиторно.

## UNIT 1

**You are to learn about very important earthmoving[1] machines – bulldozers. What words do you need to understand the information about them?**

[1] землеройные

**Ex. 1.1. Read the vocabulary attentively and find the words that belong to these categories:**

Tools _____
Characteristics (*adjectives*)_____
Actions (*verbs*)_____
Metals _____

### Vocabulary

crawler [ˈkrɔːlə] – гусеничный трактор
reclamation [ˌreklәˈmeɪʃ(ə)n] work – мелиоративные работы
tracked [trækt] – гусеничный
ground hold [ˈgraʊnd həʊld]– сцепление с грунтом
torque divider [ˌtɔːk dɪˈvaɪdə] – распределитель крутящего момента
engine power [ˈendʒɪn ˌpaʊə] –мощность двигателя
dragging [ˈdrægɪŋ] ability – тяговая способность
tool [tuːl] – рабочий орган; орудие
blade [bleɪd] – отвал
strait [streɪt] ~ – прямой отвал
universal [ˌjuːnɪˈvɜːs(ə)l] ~ – сферический отвал
S-U ~ – полусферический отвал
bull [bul] ~ – усиленный отвал
brush-rake [ˈbrʌʃreɪk] ~ – отвал типа кустарниковые грабли
ripper [ˈrɪpə] – рыхлитель
single shank [ˌsɪŋgl ˈʃæŋk] ~ – однозубый рыхлитель
multi-shank [ˌmʌltɪˈʃæŋk] ~ – многозубый рыхлитель
plate [pleɪt] – пластина
lateral curve [ˈlæt(ə)r(ə)l ˌkɜːv] – поперечная кривизна
side wings [ˈsaɪd wɪŋz] – боковые щеки (отвала)
curvature [ˈkɜːvətʃə] – кривизна
frame [freɪm] – рама
rock – камень; горная порода; скальная порода
angle [ˈæŋg(ə)l] – угол

reinforced [ˌri:ɪnˈfɔ:st] – усиленный, укрепленный
to fit – оснащать; устанавливать; монтировать
replaceable [rɪpˈleɪs(ə)b(ə)l] – сменный
tungsten-steel alloy [ˌtʌŋst(ə)n sti:l ˈælɔɪ] – сталь, легированная вольфрамом
tip – наконечник
rear attachment [ˌrɪə əˈtætʃmənt] – заднее навесное оборудование
stumpbuster [ˈstʌmpˌbʌstə] – измельчитель пней
to grind [ɡraɪnd] – перемалывать

**Ex. 1.2. Look through the text and name the numbers of the paragraphs in which the following things are mentioned:**

a) reclamation work;
b) side wings;
c) varying angle;
d) earthmoving equipment;
e) heavy ripping;
f) replaceable tip.

**Ex. 1.3. Read the text to understand in detail the arrangement of bulldozer parts and their functions.**

## Text A: Bulldozers

[1]A bulldozer is a crawler used to push large quantities of soil, sand, rubble, or other such material during construction or reclamation work. Bulldozers can be found on a wide range of sites, mines and quarries, military bases, heavy industry factories, engineering projects and farms.

[2]Most often, bulldozers are large and powerful tracked heavy equipment. The tracks give them excellent ground hold and mobility through very rough terrain[1]. Wide tracks help distribute the bulldozer's weight over a large area (decreasing pressure), thus preventing it from sinking[2] in sandy or muddy ground. Bulldozers have excellent ground hold and a torque divider designed to convert the engine's power into improved dragging ability. Because of these characteristics, bulldozers are used to clear areas of obstacles, shrubbery, burnt vehicles, and remains of structures. Modern bulldozers have a comfortable cab.

[3]The bulldozer's primary tools are the blade and the ripper.

[4]The bulldozer blade is a heavy metal plate on the front of the tractor, used to push objects, and shoving sand, soil and debris. Dozer blades usually come in three varieties:

[5] (1) A straight blade ("S blade") which is short and has no lateral curve and no side wings and can be used for fine grading[3].

[6] (2) A universal blade ("U blade") which is tall and very curved, and has large side wings to carry more material.

[7] (3) An "S-U" combination blade which is shorter, has less curvature, and smaller side wings. This blade is typically used for pushing piles of large rocks, such as at a quarry.

[8]Blades can be fitted straight across the frame, or at an angle, sometimes using additional hydraulic cylinders to vary the angle while moving. The bottom edge[4] of the blade can be sharpened, e.g. to cut tree stumps.

[9]Sometimes a bulldozer is used to push another piece of earthmoving equipment known as a "scraper". Many dozer blades have a reinforced center section with this purpose in mind, and are called "bull blades".

[10]The ripper is the long claw-like device[5] on the back of the bulldozer. Rippers can come as single (single shank) or in groups of two or more (multi-shank rippers). Usually, a single shank is preferred for heavy ripping. The ripper shank is fitted with a replaceable tungsten-steel alloy tip.

[11]A less common rear attachment is a stumpbuster, which is used to grind a tree stump. A bulldozer with a stumpbuster is used for land clearing operations, and usually has a brush-rake blade.

***Notes to the text:***

***1 – неровная местность***

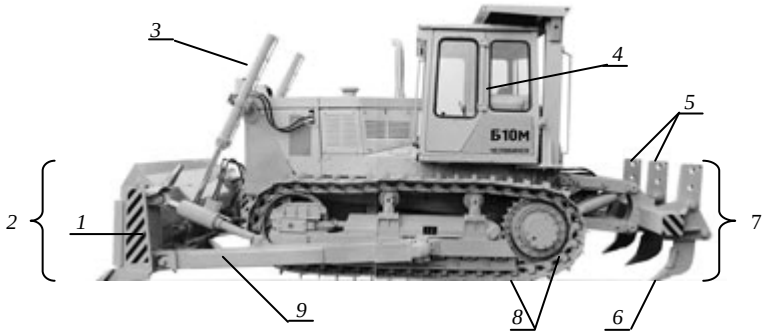
***2 – погружение***

***3 – завершающее выравнивание***

***4 – нижняя кромка***

***5 – устройство, похожее на коготь***

**Ex. 1.4. Label the parts of the bulldozer referring to the text. What kind of ripper does it have?**




*1.* _____; *2.* _____; *3.* _____; *4.* _____; *5.* _____;
*6.* _____; *7.* _____; *8.* _____; *9.* _____.

**Ex. 1.5. What are the designs and functions of bulldozer tools? Describe them using this table:**

| | | |
|---|---|---|
| | | a heavy metal plate on the front of the tractor. |
| | | usually accompanied by a brush-rake blade. |
| The shank | pushes | objects, shoves sand, soil and debris. |
| The ripper | is | used to grind a tree stump. |
| The stumpbuster | comes | in two varieties: single-shank and multi-shank. |
| The blade | can be | the claw-like rear attachment. |
| | | in tree varieties: “S”, “U” and “S-U”. |
| | | fitted with a replaceable tungsten-steel alloy tip. |

**Ex. 1.6. What makes bulldozers irreplaceable in construction and reclamation work? Place the words given below into the correct blanks.**

| torque divider | hydraulic cylinders | tracks |
|---|---|---|
| side wings | angle | bull blade |

1. Wide _____ give the bulldozer excellent ground hold and distribute its weight over a large area.
2. The _____ converts the engine's power into improved dragging ability.
3. A tall and very curved universal blade has large _____ to carry much material.
4. Blades can be fitted straight across the frame, or at a varying _____.
5. A bulldozer can have a reinforced center section – a _____ – and push a scraper.
6. _____ have enabled better manipulation of the blade.

**Ex. 1.7. Add some more details to the statements given below using the words in brackets and making the necessary changes.**

1. A bulldozer is a tracked tractor. (*crawler*)
2. A bulldozer can be equipped with a ripper. (*rear attachment*)
3. Each shank has a replaceable tip on its end. (*tungsten-steel alloy*)

4. An "S-U" blade is typically used for pushing piles of large rocks. (*curvature*)

5. A bulldozer can be used for removing bushes and roots. (*brush-rake*)

6. Some bulldozers are capable of economic and efficient grinding of tree stumps. (*stumpbuster*)

**Ex. 1.8. Learn some facts from the history of bulldozers. Translate the passage given below into Russian to see how well you understand the information.**

In early days, the bulldozer was no more than a farm tractor which had a bulldozer style blade attached to the front. This blade had no independent movement. But the old farm tractor bulldozer was difficult to remove tree stumps, push rocks and grade the ground. It was necessary to build a specific bulldozer.

In 1923, a young farmer named James Cummings and a draftsman named J. Earl McLeod made the first designs for the bulldozer. They built their machine in Morrowville, Kansas. In 1925 it was patented.

Bulldozers became widespread in the mid-1930s. Over the years, bulldozers got bigger and more powerful in response to the demand for equipment suited for larger earthworks.

In modern bulldozers blade movement is controlled by hydraulic cylinders. The operator can adjust it from within the cab. A more recent innovation is the outfitting of bulldozers with GPS technology for better machine control.

The best known maker of bulldozers is Caterpillar in the USA.

**Ex. 1.9. Answer the questions.**

1. What kinds of work can bulldozers do?
2. Where can they be found?
3. What attachments can bulldozers be fitted with?
4. Which of the three blade varieties can be used for fine grading?
5. What makes it possible for a bulldozer to cut three stumps?
6. What kind of ripper is preferred for heavy ripping? Why?
7. What are the advantages of outfitting bulldozers with hydraulic cylinders?
8. Who invented the first specific bulldozer?
9. When did bulldozers become widespread?
10. How did they evolve over time?
11. What are the benefits of using GPS technology in bulldozers?
12. Why are bulldozers preferred earthmoving machines?

**Ex. 1.10. Write an encyclopaedia entry[1] concerning bulldozers of about 100 words. Make use of the expressions given below.**

[1] статья

*powerful machine for*
*used in*
*tracked heavy equipment*
*primary tools are*
*come in three varieties / can come as*
*rear attachments*

**Ex. 1.11. Learn the words before reading text B.**

rover ['rəuvə] – вездеход
develop [dɪ'veləp] – разрабатывать, конструировать, создавать
dump truck ['dʌm trʌk] – самосвал
unlike [ʌn'laɪk] – в отличие от
life-size ['laɪfsaɪz] – в натуральную величину
wheel [wi:l] – руль
capability [ˌkeɪpə'bɪlətɪ] – возможность
heavy-duty [ˌhevɪ'dju:tɪ] – сверхмощный
research [rɪ'sɜ:ʧ] – (научное) исследование
to sustain [sə'steɪn] – поддерживать
source [sɔ:s] – источник
to conduct [kən'dʌkt] – проводить
investigation [ɪnˌvestɪ'geɪʃ(ə)n] – исследование
robotic [rəu'bɔtɪk] – роботизированный
vehicle ['vi:ɪkl] – транспортное средство
jet propulsion [prə'pʌlʃ(ə)n] – реактивное движение
amount [ə'maunt] – количество
terrain [tə'reɪn] – территория; местность
workload ['wɜ:kləud] – объем работы
power-to-weight ratio ['reɪʃɪəu] – отношение мощности к весу
approximately [ə'prɔksɪmətlɪ] – приблизительно
view [vju:] – обзор; вид
to determine [dɪ'tɜ:mɪn] – определять, устанавливать
to explore [ɪk'splɔ:] – исследовать

**Ex. 1.12. Choose the word that best fits the blank.**

1. The ability to carry cargo weighing 20 tons makes the _____ (rover / dump truck) legendary.

2. The police officer asked the driver whether he was the registered owner of the _____ (wheel / vehicle).

3. It was an eight-hour ride around 1,200 bends of rough _____ (terrain / view).

4. He has dedicated his life to scientific _____ (research / source).

5. The best way _____ (to conduct / to explore) the countryside is on foot.

6. The soil in this part of the world is not rich enough _____ (to sustain / to determine) a large population.

**Ex. 1.13. Look through the text and find the words having the same meaning as:**

- full-scale *(paragraph 2)*
- abilities *(paragraph 2)*
- powerful *(paragraph 2)*
- studies *(paragraph 4)*
- quantity *(paragraph 5)*
- around *(paragraph 6)*

**Ex. 1.14. Read the text and do the tasks that follow.**

## Text B: NASA Bulldozer Rovers Could Get the Scoop[1] On Mars

***[1]Tiny bulldozer rovers may some day dish up[2] the dirt and pack it in on Mars. The design of a prototype bulldozer rover being developed by NASA engineers mimics[3] that of a bulldozer and dump truck.***

[2]Unlike a life-size bulldozer and dump truck, which can weigh several thousand pounds, these rovers are lightweight, intelligent and can work without an operator at the wheel. Yet they have the same capabilities, relative to their size, as their heavy-duty counterparts[4].

[3]Robotics engineers think the basic research on these bulldozing rovers may support future missions to look for life or to sustain a human presence.

[4]"If water sources, such as hot springs, layers of ice or groundwater reservoirs are discovered on Mars, a network of these rovers could conduct scientific investigations and excavate the site piece-by-piece, just as humans would on an archeological dig[5]," said Brian Wilcox, supervisor of the Robotic Vehicles Group at NASA's Jet Propulsion Laboratory, Pasadena, California. "Rovers like these may also play a role in establishing a space outpost[6] for eventual human occupancy[7]. They may be used to create buried habitats[8] or utility trenches[9] and to excavate resources to support life."

[5]"We think a greater amount of terrain can be excavated if the workload is shared among several smaller vehicles. Smaller solar powered vehicles have a higher power-to-weight ratio than bigger vehicles, yet together can perform the same tasks as a large vehicle," said Wilcox.

[6]Weighing approximately 3.6 kilograms (8 pounds), the bulldozer rovers have arms with a tiny scoop to dig up and dump the soil into an overhead bucket[10]. They use their arms to right themselves if they fall over. Working in groups, they will create a virtual communications network with a central control tower, equipped with stereo cameras that will provide a 360-degree view of the terrain. A reflector will unfurl[11] from the tower and divert[12] the Sun's energy to the bulldozer rovers that are down a hole[13] or ditch[14].

[7]The bulldozer rovers share the same processor and software as the nanorover originally designed to fly on a Japanese asteroid mission. Four prototypes are working at this time. Engineers are working to determine the optimum size of the rovers for excavation tasks.

[8]"When people hear about the work we do, they sometimes think we are just talking science fiction," said Wayne Schober, manager for advanced robotics surface systems at JPL. "We worked on some of the most advanced robotic vehicle designs of the mid-1980s, such as those that enabled the two-armed coordinated robots for the International Space Station, the Mars Pathfinder Rover and the rovers about to explore Mars. We are not all fun and games. We mean business."

***Notes to the text:***
***1 – совок; ковш***
***2 – собрать***
***3 – имитирует***
***4 – аналоги***
***5 – археологические раскопки***
***6 – космический аванпост***
***7 – заселение людьми***
***8 – подземные жилища***
***9 – траншеи для инженерных сетей***
***10 – подвесной ковш***
***11 – развернется***
***12 – направит***
***13 – яма***
***14 – канава***

**Ex. 1.15. Answer the questions.**

1. Who is developing the design of a prototype bulldozer rover for Mars?
2. What does this design mimic?
3. What capabilities do the rovers have?
4. What role may such rovers play?
5. How can a greater amount of terrain be excavated?
6. How much does a bulldozer rover weigh?
7. What are the bulldozer rovers equipped with?
8. Where do the bulldozer rovers get energy for their work?

9. What are engineers working at now?

10. What do people think when they hear about the work of the Jet Propulsion Laboratory?

**Ex. 1.16. Say whether the statements are true of false. Correct the false ones.**

1. The rovers are lightweight and intelligent but can't work without an operator at the wheel.

2. Hot springs, layers of ice or groundwater reservoirs could prevent the rovers from working on Mars.

3. The Robotic Vehicles Group is a part of NASA's Jet Propulsion Laboratory.

4. Smaller solar powered vehicles have a lower power-to-weight ratio than bigger vehicles.

5. The bulldozer rovers will never work in groups.

6. The rovers use their arms to right themselves if they fall over.

7. The processor and software of the bulldozer rovers differs greatly from those of the nanorover originally designed to fly on a Japanese asteroid mission.

**Ex. 1.17. Join the halves of the sentences.**

| | |
|---|---|
| 1. Tiny bulldozer rovers may some day | a. to create buried habitats or utility trenches and to excavate resources to support life. |
| 2. The basic research on these bulldozing rovers may support | b. a virtual communications network with a central control tower, equipped with stereo cameras. |
| 3. They may be used | c. working at this time. |
| 4. Working in groups, they will create | d. dish up the dirt and pack it in on Mars. |
| 5. Four prototypes are | e. some of the most advanced robotic vehicle designs of the mid-1980s. |
| 6. They worked on | f. future missions to look for life or to sustain a human presence. |

**Ex. 1.18. Do you think it's important to explore planets other than Earth? Why? / Why not?**

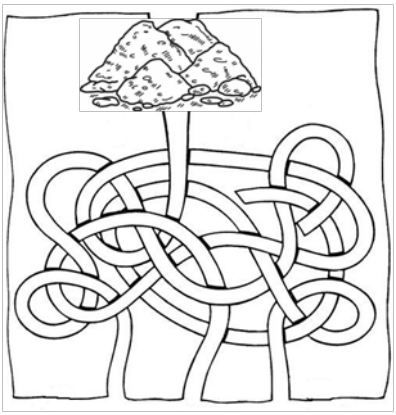
**Ex. 1.19. Would you like to work in a team of extraterrestrial rover designers? What kind of extraterrestrial vehicle would you like to develop?**

# Fun with bulldozers

**Ex. 1.20. Moving across and down find 8 hidden words related to bulldozers.**

| u | g | d | f | x | q | a | b | a | s | j | o | z | c | e | q | w | t |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| z | j | v | m | t | o | o | l | h | k | r | h | a | l | k | r | p | q |
| d | p | k | k | y | e | u | a | t | t | a | c | h | e | m | e | n | t |
| s | y | l | u | m | q | t | d | y | k | l | o | z | b | n | r | x | e |
| q | d | c | r | a | w | l | e | r | g | d | j | u | o | f | m | o | y |
| a | e | n | a | m | r | u | o | i | b | j | w | e | o | f | k | l | p |
| u | r | q | n | s | t | u | m | p | b | u | s | t | e | r | d | q | o |
| e | l | v | k | w | d | j | k | p | t | o | a | f | y | i | m | e | k |
| c | u | r | v | a | t | u | r | e | m | w | k | o | e | f | q | z | h |
| m | z | d | w | y | s | o | f | r | a | m | e | z | x | v | n | u | l |

**Ex. 1.21. Help the bulldozer to find its way to the worksite. Which path should it take?**



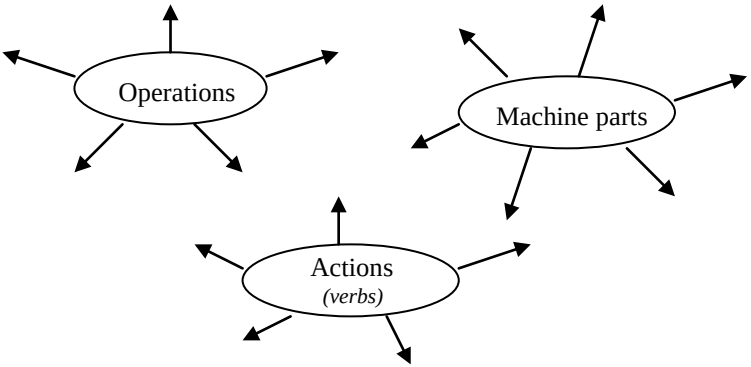
**A B C**

## UNIT 2

**You are to study scrapers and graders – earthmoving equipment used in civil engineering[1]. What words do you need to understand their description?**

[1] строительство

**Ex. 2.1. Read the vocabulary carefully and find the words that can be put into the following groups:**




### Vocabulary

digging [ˈdɪgɪŋ] – выемка грунта; рытье; копание
loading [ˈləʊdɪŋ] – загрузка
hauling [ˈhɔːlɪŋ] – транспортировка
dumping [ˈdʌmpɪŋ] – выгрузка; разгрузка в отвал
spreading [ˈspredɪŋ] – распределение
hopper – ковш (скрепера)
bowl [bəʊl] – ковш (скрепера)
edge [edʒ] – кромка
cutting [ˈkʌtɪŋ] ~ – режущая кромка; нож ковша скрепера
to lower [ˈləʊə] – опускать
to raise [reɪz] – поднимать
apron [ˈeɪpr(ə)n] – заслонка (фартук) ковша скрепера
ejector [ɪdˈʒektə] – выталкиватель (породы из ковша скрепера)
cut [kʌt] – выемка; котлован
site [saɪt] – место

empty [ˈemptɪ] – пустой
engine [ˈendʒɪn] – мотор, двигатель
~ capacity [kəˈpæsətɪ] – мощность двигателя
scraper [ˈskreɪpə] – скрепер
elevating [ˈelɪveɪtɪŋ] ~ – скрепер с элеваторной загрузкой
twin engine push-pull [ˌpuʃˈpul] ~ – двухмоторный сдвоенный скрепер
twin engine auger [ˈɔːgə] ~ – двухмоторный скрепер со шнековой загрузкой
pull-type [ˈpultaɪp] ~ прицепной скрепер
wheel [wiːl] – колесо
to pull – тянуть
conveyor arrangement [kənˌveɪə əˈreɪndʒmənt] – конвейерное устройство
flight [flaɪt] – скребок (скрепера)
push-tractor – трактор-толкач
self-propelled [ˌselfprəˈpeld] – самоходный
axle [ˈæks(ə)l] – ось
tri- [traɪ] ~ – трехосный
grader [ˈgreɪdə] – грейдер
surface [ˈsɜːfɪs] – поверхность
flat ~ – ровная горизонтальная поверхность
inclined [ɪnˈklaɪnd] ~ – наклонная поверхность
grade – уровень грунта

**Ex. 2.2. What kinds of information do you think are mentioned in the text given below? Look through the text and tick (✓) what you have found:**

a) work done by scrapers;
b) types of scrapers;
c) work done by graders;
d) types of graders;
e) arrangement of scraper and grader parts;
f) history of scrapers and graders.

**Ex. 2.3. Read the text attentively to learn about the characteristics of these earthmovers and where and how they are used.**

## Text A: Scrapers and Graders

[1]A scraper is a large piece of equipment capable of digging, loading, hauling, dumping, and spreading materials. Self-propelled scrapers were invented in the 1930s. Most current scrapers have two axles, although historically tri-axle configurations were dominant.

[2]The rear part has a vertically moveable hopper (also known as the bowl) with a sharp horizontal front edge. The hopper can be hydraulically lowered and raised. When the hopper is lowered, the front edge cuts into the soil and fills the hopper as the grader moves forward. To cut hard materials and load the scraper a bulldozer pushing from behind may be required. When the hopper is full (8 to 34 $m^3$, depending on type) it is raised, and closed with a vertical blade[1] known as the apron. The scraper can transport its load to the fill area where the blade is raised, the back panel of the hopper, or the ejector, is hydraulically pushed forward and the load tumbles out. Then the empty scraper returns to the cut site and repeats the cycle.

[3]On the elevating scraper the bowl is filled by a type of conveyor arrangement fitted with horizontal flights to move the material engaged[2] by the cutting edge into the bowl as the machine moves forward. Elevating scrapers do not require assistance from push-tractors.

[4]Scrapers can be very efficient on short hauls where the cut and fill areas are close together and have sufficient length to fill the hopper. The heavier scraper types have two engines, one driving the front wheels, one driving the rear wheels, with engines up to 400 kW (536 hp[3]).

[5] Types of scrapers:

[6] (1) Single engine open bowl (usually needs a bulldozer to assist in loading).

[7] (2) Single engine elevating scraper (uses an elevator to load material and needs no push-tractor).

[8] (3) Twin engine open bowl (has two engines, usually no push-tractor is required).

[9] (4) Twin engine push-pull (a system of two standard scrapers hooked[4] together using the four engines' power while loading; no push-tractor is needed).

[10] (5) Twin engine auger scraper (uses a giant auger mounted vertically in the bowl to pull the material upwards).

[11] (6) Pull-type scraper (uses agricultural tractor or bulldozer to pull).

[12] A grader is a construction machine with a long blade used to create a flat surface. Typical models have three axles, with the engine and cab situated above the rear axles at one end of the vehicle and a third axle at the front end of the vehicle, with the blade in between. In certain countries, for example in Finland, almost every grader is equipped with a second blade that is placed in front of the front axle. Blade width ranges from of 2.50 to 7.30 m and engine capacity ranges from 93–373 kW (125–500 hp).

[13] The grader's purpose is to "finish grade" the "rough grading" performed by heavy equipment or engineering vehicles such as scrapers and bulldozers.

[14] Graders are commonly used in the construction and maintenance of dirt roads and gravel roads[5]. In the construction of paved roads[6] they are

used to create a wide flat surface for the asphalt to be placed on. Graders are also used to finish grade prior to the construction of large buildings. Graders can produce inclined surfaces. In some countries they are used to produce drainage ditches with shallow V-shaped cross-sections on either side of highways. In certain places, graders are often used in municipal and residential snow removal.

[15] Modern graders can be outfitted with GPS for precise grade control.

***Notes to the text:***

***1 – здесь: пластина***

***2 – здесь: отделенный от массива (срезанный ножом) грунт***

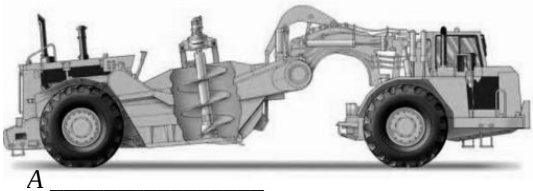
***3 – hp – horse power***

***4 – сцепленные***

***5 – грунтовые и гравийные дороги***

***6 – дороги с асфальтовым покрытием***

**Ex. 2.4. Match the types of machines with the pictures (A-F).**



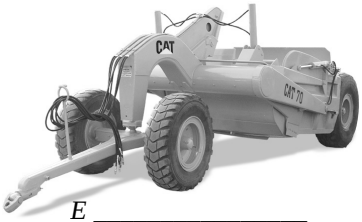
*A* _____

*B* _____

*C*_____

| |
|---|
| push-pull scraper |
| double blade grader |
| auger scraper |
| open bowl scraper |
| elevating scraper |
| pull-type scraper |

*D* _____




*E* _____

*F* _____

**Ex. 2.5. Replace the Russian words with the English ones to complete the descriptions:**

**A)** (*Самоходные*) scrapers are large machines used for digging, hauling, (*выгрузка*) and (*распределение*) materials in a variety of construction jobs. These machines quickly move large quantities of earth around a construction site, unlike the less popular (*прицепной*) scraper.

A standard self-propelled scraper is comprised of a (*ковш*), an apron and an (*выталкиватель*). These scrapers vary in the number of (*моторы*), bowls, and (*колеса*) they have.

An (*с элеваторной загрузкой*) scraper has a hydraulically- or electrically-driven elevator instead of an apron. The elevator (*скребки*) load the material into the scraper's bowl.

In an (*шнековый*) scraper, a vertical auger hydraulically rotated inside the bowl raises the material into it.

**B)** Graders are machines used to create (*ровная горизонтальная*) or (*наклонная*) surfaces. The main tool of a grader is its (*отвал*). Most graders have three (*оси*). The engine (*мощность*) may range from 125hp to 500hp.

**Ex. 2.6. Fill in the blanks with the words from the box to outline the working cycle of a scraper:**

| apron | hopper | edge | loaded | hauls | empty | ejector |
|---|---|---|---|---|---|---|

1. The _____ is lowered.
2. The scraper moves forward and the front _____ of the hopper cuts into the soil.
3. The hopper is _____.
4. The full hopper is raised and closed with the _____.
5. The scraper _____ its load to the fill area.
6. The apron is raised and the _____ pushes the load out of the hopper.
7. The _____ scraper returns to the cut site.

**Ex. 2.7. Say whether the statements are true of false. Correct the false ones.**

1. Scrapers are capable of digging and transporting materials.
2. Most modern scrapers have three axles.
3. The scraper bowl is immovable.
4. The bowl can haul 8 to 34 $m^3$ of material.
5. The maximum capacity of scraper engines is 400 hp.
6. Grader blades vary in width from of 2.50 to 7.30 m.
7. Graders can only produce a flat surface.
8. Graders are not used in reclamation work.

**Ex. 2.8. Answer the questions.**

1. What is the main tool of a scraper? What is its function?
2. When do scrapers need push-tractors?
3. What are the advantages of self-propelled scrapers over pull-type ones?
4. What jobs can graders do?
5. Where is the grader blade usually situated?
6. Why is the grader used after scrapers and bulldozers?

**Ex. 2.9. You work at a plant making scrapers and graders. Write a short advertisement for one model of scraper and for one model of grader to sell your produce. Mention the name of your product, its functions and specifications, emphasize its superiority. Use some of the expressions given below.**

*is designed for*
*is a self-propelled machine*
*Its unique … technology guarantees*
*It has*
*It is equipped with*
*is superior to*

**Ex. 2.10. Learn the words before reading text B.**

versatile ['vɜːsətaɪl] – универсальный
efficient [ɪ'fɪʃ(ə)nt] – эффективный
cost-cutting – экономичный, снижающий стоимость
challenge ['ʧælɪnʤ] – сложная задача
strength [streŋθ] – прочность
durability [ˌdjuərə'bɪlətɪ] – долговечность
conditions [kən'dɪʃ(ə)nz] – условия
controls [kən'trəulz] – средства управления
inexperienced [ˌɪnɪk'spɪərɪənst] – неопытный
to ensure [ɪn'ʃuə] – обеспечивать
consistency [kən'sɪst(ə)nsɪ] – постоянство
wheel slip – пробуксовка колёс
ground speed ['graund spiːd] – поступательная скорость
job site – рабочая площадка
duration [djuə'reɪʃ(ə)n] – продолжительность; время
gear [gɪə] – передача
fuel [fjuːəl] – топливо
mode [məud] – режим
feature ['fiːʧə] – характеристика
transmission shift point – точка переключения коробки передач
rpm (revolutions per minute) – [число] оборотов в минуту, об/мин
to aid [eɪd] – помогать
saving – экономия
payload ['peɪləud] – полезная нагрузка; грузоподъемность.
optional ['ɔpʃ(ə)n(ə)l] – дополнительный, устанавливаемый по желанию заказчика
accuracy ['ækjərəsɪ] – точность
to avoid – избегать
to simplify ['sɪmplɪfaɪ] – упрощать

**Ex. 2.11. Tick (✓) the sentence that uses the underlined part correctly.**

1 ___ **A** Then Tesla decided that the market needs a more versatile car.
___ **B** Unfortunately, new cars are quite cost-cutting, especially now.
2 ___ **A** Tesla's autopilot reduces car conditions by 50%.
___ **B** Electronic controls use electrical signals and digital algorithms to perform their functions.
3 ___ **A** Pneumatic tyres were ensured in 1888 by John Dunlop.
___ **B** The pilots had to take emergency action to avoid a disaster.

4 ___ **A** It also increases stability by reducing wheel slip on unpaved or snow-covered roads

___ **B** Our electronic page has now good ground speed.

5 ___ **A** The operator sits in the fuel, and from there he performs all manipulations.

___ **B** On some electronic devices, different modes are available.

6 ___ **A** It combines enhanced functionality, payload, and the lowest price in its class.

___ **B** He entered the wrong number by accuracy.

**Ex. 2.12. Look through the text and find the words having the same meaning as:**

- difficult tasks *(paragraph 1)*
- constancy *(paragraph 2)*
- periods *(paragraph 3)*
- characteristic *(paragraph 4)*
- to help *(paragraph 4)*
- makes easy *(paragraph 7)*

**Ex. 2.13. Read the text and do the tasks that follow.**

## Text B: Caterpillar Scrapers are Versatile, Efficient, and Cost-Cutting Tools

[1]Cat's 637K Wheel Tractor-Scraper is engineered to conquer[1] challenges operators face worldwide. With its strength and durability, it works in some of the most difficult conditions and materials one can find. Ergonomic controls and a newly redesigned cab interior provide a more comfortable and efficient working environment all day long.

[2]Load Assist[2] is designed to help shorten the learning curve[3] of inexperienced operators to ensure consistency and faster loading of material while reducing effort of the operator. Based on the speed of the machine, Load Assist automatically adjusts[4] the cutting edge height to manage wheel slip and to ensure consistent and efficient loading in bulk earthmoving applications[5].

[3]Ground Speed Control sets the desired top speed by the operator if the job site requires a speed less than full run out[6]. Machine Speed Limit is intended for use when top speed needs to be limited for longer durations and Ground Speed Control is intended for use when the top speed needs to be reduced for shorter segments or intermediate periods of time. The operator can set the desired top speed and the machine will find the correct gear that works best for the engine and transmission.

[4]Fuel Economy Mode is a two part feature when selected. The first part of the feature lowers the transmission shift points allowing shifting to take place at lower rpm to aid in fuel savings. The second part of the Fuel Economy Mode

allows the machine when operated at engine rpm less than full throttle[7] to automatically vary the power distribution between the tractor and the scraper.

[5]The Payload Estimator[8] (optional) will calculate the payload of the machine in tonnes by measuring the bowl lift cylinder pressures at the beginning of the loaded haul segment. This feature works best when using Sequence Assist[9]. Using Payload Estimator during testing has achieved better than 95% accuracy when compared to actual scale weights. The Payload Estimator feature comes automatically when a machine is ordered with Sequence Assist.

[6]Cat Grade Control (optional) intelligently ensures the machine does not cut below grade in the cut area or over fill in the fill area, avoiding rework and moving unnecessary material.

[7]Sequence Assist (optional) uses cylinder position sensors to automate bowl, apron and further implement controls throughout the four core work cycles: Dig, Haul, Unload and Return. When utilized this can reduce up to 14 individual operator commands per cycle. Sequence Assist simplifies control over the implements, reduces joystick usage, automatically controls cushion hitch[10], transmission hold[11] and ejector.

[8]Machine Speed Limit is designed to take the place of top gear[12] selection. If the machine top speed needs to be limited the operator can select the top speed through the display. This will allow the machine to find the correct gear that works best for the engine and transmission.

***Notes to the text:***

***1 – здесь: решить***
***2 – устройство помощи при загрузке***
***3 – время обучения***
***4 – регулирует***
***5 – при массовых земляных работах***
***6 – полный выбег***
***7 – полный газ***
***8 – устройство оценки полезной нагрузки***
***9 – устройство автоматизации последовательности операций***
***10 – амортизатор-сцепка***
***11 – блокировка трансмиссии***
***12 – высшая передача***

**Ex. 2.14. Answer the questions.**

1. What kind of tools are Caterpillar scrapers?
2. What provides a more comfortable and efficient working environment all day long?
3. What is Load Assist designed for?
4. What is Ground Speed Control intended for?
5. When is Machine Speed Limit used?

6. How many parts does Fuel Economy Mode have?
7. How does the Payload Estimator work?
8. What does Cat Grade Control ensure?
9. What is the function of Sequence Assist?
10. What is Machine Speed Limit designed for?

**Ex. 2.15. Say whether the statements are true of false. Correct the false ones.**

1. Cat's 637K Wheel Tractor-Scraper can't work in difficult conditions.
2. Load Assist is based on the speed of the machine.
3. Ground Speed Control sets the desired top speed by the operator if the job site requires a speed less than full run out.
4. Cat Grade Control is an optional feature.
5. The Payload Estimator is a standard feature.
6. Sequence Assist is a standard feature.
7. When utilized Sequence Assist can reduce up to 12 individual operator commands per cycle.
8. If the machine top speed needs to be limited the operator can select the top speed through the display.

**Ex. 2.16. Join the halves of the sentences.**

| | |
|---|---|
| 1. Cat's 637K Wheel Tractor-Scraper is engineered | a. and the machine will find the correct gear that works best for the engine and transmission. |
| 2. Load Assist automatically adjusts the cutting edge height | b. the transmission shift points allowing shifting to take place at lower rpm to aid in fuel savings. |
| 3. The operator can set the desired top speed | c. when a machine is ordered with Sequence Assist. |
| 4. The first part of the feature lowers | d. to conquer challenges operators face worldwide. |
| 5. The second part of the Fuel Economy Mode allows | e. the machine when operated at engine rpm less than full throttle to automatically vary the power distribution between the tractor and the scraper. |
| 6. The Payload Estimator feature comes automatically | f. to ensure consistent and efficient loading in bulk earthmoving applications. |

**Ex. 2.17. Do you think the more automation a machine has the better? Why? / Why not?**

**Ex. 2.18. What do think about the use of autopilots in vehicles?**

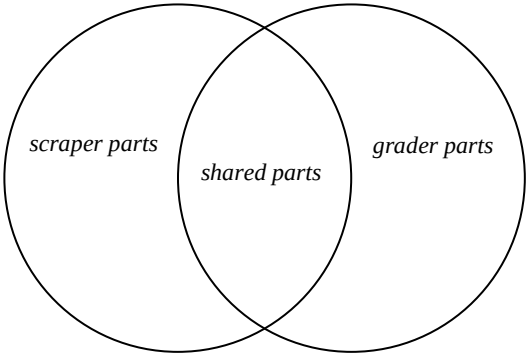
## Fun with scrapers and graders

**Ex. 2.19. Moving across and down find 10 hidden words related to scrapers and graders and their work.**

| z | q | c | u | t | x | o | d | i | g | g | i | n | g | p | k | l | b |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| g | h | l | n | f | p | o | u | g | a | f | f | h | y | u | j | f | u |
| m | i | p | m | z | s | e | m | n | u | l | o | a | d | i | n | g | a |
| l | y | f | i | l | z | q | p | k | e | c | x | u | w | d | e | h | y |
| e | g | e | a | r | m | s | i | t | e | h | p | l | b | i | z | x | i |
| a | f | a | d | d | k | p | n | q | w | i | y | i | j | f | u | e | l |
| o | i | t | b | r | k | o | g | r | y | j | s | n | y | u | k | w | m |
| b | n | u | v | h | e | t | l | v | e | w | k | g | x | e | l | u | s |
| m | h | r | m | r | q | h | v | d | u | r | a | b | i | l | i | t | y |
| x | y | e | g | h | k | p | o | s | q | x | e | y | m | z | o | h | r |

**Ex. 2.20. Draw this Vienn diagram in your exercise books and sort out the words into the three categories.**

*cab*
*auger*
*blade*
*apron*
*engine*
*elevator*
*ejector*



## UNIT 3

**The class of earthmoving machines you are going to learn about is named excavators. What words do you need to understand their configurations and functions?**

**Ex. 3.1. Read the vocabulary attentively and choose the words belonging to the following categories:**

Types of booms _____
Types of buckets _____
Kinds of tanks _____
Actions (*verbs*)_____
Operations _____

### Vocabulary

boom [bu:m] – стрела (экскаватора)
mono [’mɒnə(ʊ)]~ – монострела
knuckle [nʌkl] ~ –поворотная стрела
hinge [hɪndʒ] ~ – шарнирная стрела
triple-articulated [,trɪpl □;tɪkju’leɪtɪd] ~ – трехсекционная стрела
stick – рукоять (ковша экскаватора)
bucket [’bʌkɪt] – ковш (экскаватора)
large capacity ~ – ковш большой вместимости
general purpose [’pɜ:pəs] ~ – универсальный ковш
rotating platform [rəʊ,teɪtɪŋ ’plætfɔ:m]– поворотная платформа (экскаватора)
house [haʊs] – поворотная платформа (экскаватора)
undercarriage [’ʌndə,kærɪdʒ] – шасси, ходовое устройство
cable-operated excavator [,keɪbl,ɒpəreɪtɪd ’ekskəveɪtə] – экскаватор с канатным приводом
winch [wɪntʃ] – лебедка
steel rope [rəʊp] – стальной канат
power shovel [’ʃʌv(ə)l] – механическая лопата (мехлопата); одноковшовый экскаватор
hydraulic fluid [haɪ,drɔ:lɪk ’flu:ɪd] – рабочая жидкость
trench – канава; траншея
hole [həʊl] – яма
material [mə’tɪərɪəl] handling – загрузка-разгрузка материалов
track frame [freɪm] – гусеничная рама
final drive [’faɪn(ə)l draɪv] – бортовая передача

hydraulic motor [ˈməʊtə] – гидромотор
gearing [ˈgɪərɪŋ] – редуктор
counterweight [ˈkaʊntəweɪt] – противовес
tank – бак
fuel [ˈfjuːəl] ~ – топливный бак
hydraulic oil ~ – маслобак гидросистемы
centre pin – центральная цапфа
to slew [sluː] – вращать(ся), поворачивать(ся)
hinge – шарнир
to pivot [ˈpɪvət] – вращать(ся), поворачивать(ся)
digging force [fɔːs] – усилие резания (ковша экскаватора)
cleanup [ˈkliːnʌp] – зачистка забоя
leveling [ˈlev(ə)lɪŋ] – планировка (поверхности)
hardened [ˈh□ɖ(ə)nd] – из закаленной стали
side cutter – боковая режущая кромка
backhoe [ˈbækhəʊ] – обратная лопата
to scoop [skuːp] – копать
front [frʌnt] shovel – прямая лопата

**Ex. 3.2. Look through the text and find out in which paragraphs these things are mentioned:**

a) power shovel;
b) rotating platform;
c) undercarriage;
d) final drives;
e) counterweight;
f) side cutters.

**Ex. 3.3. Read the text carefully to get to know the details of excavator arrangements and their functions.**

## Text A: Excavators

[1]Excavators are heavy construction equipment consisting of a boom, stick, bucket and cab (cabin) on a rotating platform, known as the "house". The house sits atop an undercarriage with tracks or wheels.

[2]A cable-operated excavator uses winches and steel ropes to accomplish the movements. They are often called power shovels. All movement and functions of a hydraulic excavator are accomplished through the use of hydraulic fluid, with hydraulic cylinders and hydraulic motors.

[3]Excavators are used in many ways: digging of trenches, holes, foundations; material handling, etc.

[4]Excavators come in a wide variety of sizes. The smaller ones are called mini or compact excavators**.** Caterpillar's smallest mini-excavator weighs

930 kg and has 13 hp; their largest model is the largest excavator available the CAT 6090, it weighs over 979,990 kg, has 4500 hp and has a bucket size of around 52.0 $m^3$.

[5]The two main sections of an excavator are the undercarriage and the house. The undercarriage includes the blade (if fitted), tracks, track frame, and final drives, which have a hydraulic motor and gearing providing the drive to the individual tracks[1], and the house includes the operator cab, counterweight, engine, fuel and hydraulic oil tanks. The house attaches to the undercarriage by way of a centre pin, allowing the machine to slew 360°.

[6]The main boom attaches to the house, and can be one of several different configurations:

[7] (1) Most are mono booms: these have no movement apart from straight up and down.

[8] (2) Some others have a knuckle boom which can also move left and right in line with the machine.

[9] (3) Another option is a hinge at the base of the boom allowing it to hydraulically pivot up to 180° independently of the house; however, this is generally available only to compact excavators.

[10] (4) There are also triple-articulated booms (TAB).

[11] Attached to the end of the boom is the stick. The stick provides the digging force needed to pull the bucket through the ground.

[12] On the end of the stick is usually a bucket. A wide, large capacity bucket with a straight cutting edge is used for cleanup or leveling where the material to be dug is soft, and teeth are not required. A general purpose (GP) bucket is generally smaller, stronger, and has hardened side cutters and teeth used to break through hard ground and rocks. Buckets have numerous shapes and sizes for various applications.

[13] Excavators are classified according to their bucket action. A downward arch[2] bucket motion is known as a backhoe. This bucket moves down and away from the excavator, and then scoops back towards it in an upward motion. When the bucket moves up and away, the machine is known as a front shovel.

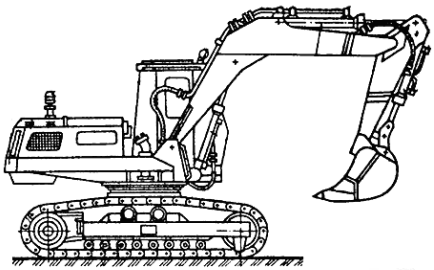
***Notes to the text:***

***1 – осуществляющий индивидуальный привод к гусеницам***

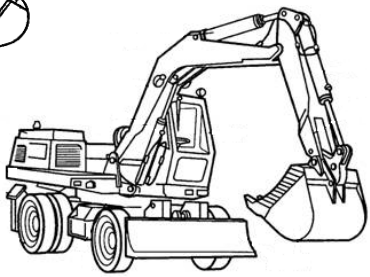
***2 – дугообразное***

**Ex. 3.4. Look at the pictures on pages 29-30 and tick (✓) the characteristics of the excavators:**

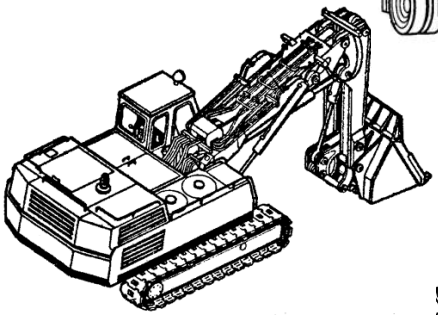
| | *cable-operated* | *hydraulic* | *backhoe* | *front shovel* | *tracked* | *wheeled* | *blade-fitted* |
|---|---|---|---|---|---|---|---|
| Model A | | | | | | | |
| Model B | | | | | | | |
| Model C | | | | | | | |
| Model D | | | | | | | |
| Model E | | | | | | | |



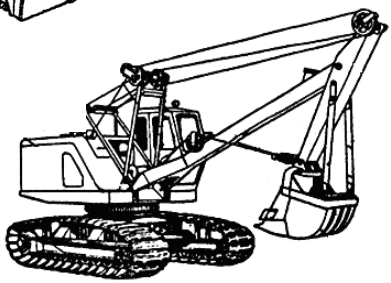
*Model A*



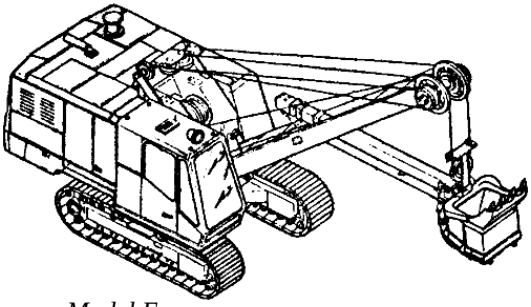
*Model B*



*Model C*



*Model D*



*Model E*

**Ex. 3.5. Put each word in the correct blank to make sure you understand excavator mechanisms.**

1) **power shovels / steel ropes**
_____ make use of winches and _____ to perform digging of trenches, holes, and material handling.
2) **undercarriage / house**
The _____ is placed on top of a tracked or wheeled _____ .
3) **slewing / central pin**
The _____ allows _____ the house 360 degrees.
4) **rotating platform / counterweight**
The _____ has the operator cab, _____, engine, fuel and hydraulic oil tanks.
5) **gearing / final drives**
_____ in the undercarriage have a _____ providing the drive to the individual tracks
6) **boom / stick**
Attached to the house is the _____ that is connected to the _____ with a bucket on its end.

**Ex. 3.6. Describe excavator parts and their purposes using the table.**

| | | |
|---|---|---|
| | | a straight cutting edge |
| The mono boom | | up to 180° independent to the house. |
| The knuckle boom | pivots | hardened side cutters and teeth. |
| The hinge boom | moves | to break through hard ground. |

| | | |
|---|---|---|
| The general purpose bucket | has | left and right in line with the excavator. |
| The large capacity bucket | is used | straight up and down. |
| | | for cleanup or leveling where the material is soft. |

**Ex. 3.7. Choose the best ending for each sentence. Refer to the text if necessary.**

1. The two main sections of an excavator are
   a) the blade and the ripper.
   b) the undercarriage and the house.
   c) the hopper and the blade.
2. The operator's cab is situated
   a) on the undercarriage.
   b) in the bucket.
   c) on the house.
3. Winches and steel ropes are typical of
   a) cable-operated excavators.
   b) hydraulic excavators.
   c) both cable-operated and hydraulic excavators.
4. Compact excavators are generally equipped with
   a) triple-articulated booms.
   b) hinge booms.
   c) mono booms.
5. Excavators are classified into front shovels and backhoes according to
   a) their bucket motion.
   b) their bucket size.
   c) the size of their hydraulic oil tanks.
6. The excavator can slew 360° due to
   a) the counterweight.
   b) the side cutters.
   c) the center pin.
7. The digging force needed to pull the bucket through the ground is provided
   a) by the stick.
   b) by the boom.
   c) by the track frame.
8. A bucket used to dig soft material
   a) has no cutting edge.

b) has no teeth.

c) has hardened side cutters and teeth.

**Ex. 3.8. Say whether the following statements are true, false or not mentioned in the text.**

1. The ancestor of the modern excavator was the Steam Shovel, patented by William Smith Otis in 1839.
2. Excavators make holes and trenches by scooping the material.
3. Their undercarriage is always fitted with a blade.
4. Fuel and hydraulic oil tanks are situated on the house.
5. All types of booms are capable of pivoting independently of the house.
6. Caterpillar's smallest compact excavator weighs 930 kg and has 13 hp.
7. Medium size excavators can weigh 6300 kg to 37800 kg.
8. Caterpillar's largest model has 2500 hp and has a bucket size of around 32.0 $m^3$.
9. Efficient engines and hydraulics make John Deere excavators the most reliable machines.
10. Besides digging excavators can be adapted for a variety of tasks by replacing the bucket with other tools.

**Ex. 3.9. Choose a model of excavator you like best and prepare its presentation for an exhibition. The expressions given below will help you to structure your talk.**

| Beginnings and endings: | Referring to visuals: |
|---|---|
| *I'd like to talk about ...* | *As you can see in the picture, ...* |
| *My talk today is about ...* | *The first / second next slide shows ...* |
| *There are (two / three) parts to it: ...* | *Look at Figure 2.* |
| *Firstly, ... Secondly, ... Finally, ...* | *If you at the diagram, you can see ...* |
| *To conclude / to sum up ...* | *The slide / picture shows ...* |

**Ex. 3.10. Learn the words before reading text B.**

skilful ['skɪlf(ə)l] – умелый
rescue ['reskjuː] – спасение
remote-control [rɪˌməut kən'trəul] – с дистанционным управлением
disaster [dɪ'zɑːstə] – стихийное бедствие
operability – эксплуатационные качества
conventional [kən'ven(t)ʃ(ə)n(ə)l] – обычный
verification test – проверочные испытания
to represent [ˌreprɪ'zent] – представлять (в виде чего-л.)
level ['lev(ə)l] – уровень

performance [pə'fɔ:məns] – производительность
to confirm [kən'fɜ:m] – подтверждать,
inertia [ɪ'nɜ:ʃə] – инерция
target values ['vælju:z] – целевые значения
fine tuning ['tju:nɪŋ] – точная настройка
speed [spi:d] – скорость
to estimate ['estɪmeɪt] – оценивать
external [ɪk'stɜ:n(ə)l] – внешний
force – сила
feedback ['fi:dbæk] – обратная связь
tele-operated [ˌtelɪ'ɔp(ə)reɪtɪd] – с дистанционным управлением
to measure ['meʒə] – измерять
frequency ['fri:kwənsɪ] – частота
vibration [vaɪ'breɪʃ(ə)n] – вибрация
vibrotactile [ˌvaɪbrəʊ 'tæktaɪl] – вибротактильный
unmanned aircraft ['eəkrɑ:ft] vehicle – беспилотный летательный аппарат
arbitrary ['ɑ:bɪtr(ə)rɪ] – произвольно выбранный
to assess [ə'ses] – оценивать

**Ex. 3.11. Replace the words printed *in italics* with the words from the word bank, which have the same meaning.**

| Word Bank | drones operability fine-tuning<br>skilful performance remote controls<br>target values rescue |
|---|---|

1. None of those aircraft is certified for sea *saving people's lives*.
2. These young engineers are very *good at their work* and that is important.
3. Present-day TV *electronic devices for operating something from a distance* regulate functions such as volume, channels, playback, track change, and various other features.
4. Hitachi ICT Hydraulic Excavators are characterized by improved safety and excellent *functional quality*.
5. The final *precise adjustment* of the machine was stopped to introduce new qualitative changes.
6. This model is being redesigned to achieve *planned parameters*.
7. The machine designers have managed to reduce fuel and maintenance costs while improving *the effectiveness of functioning*.
8. A few years ago *unmanned aircraft vehicles* were virtually unknown.

**Ex. 3.12. Look through the text and find the words having the same meaning as:**

- catastrophe *(paragraph 1)*
- ordinary *(paragraph 1)*
- power *(paragraph 4)*
- rate *(paragraph 3)*
- response *(paragraph 4)*
- shaking *(paragraph 5)*

**Ex. 3.13. Read the text and do the tasks that follow.**

**Text B: Skilful rescue robot with remote-control function**

***[1]A group of Japanese researchers developed a prototype construction robot for disaster relief[1] situations. This prototype has drastically improved operability and mobility compared to conventional construction machines.***

[2]A group of research leaders at Osaka University, Kobe University, Tohoku University, The University of Tokyo, and Tokyo Institute of Technology developed construction robots for disaster relief in order to solve various challenges of conventional construction machines used in such situations. Using a prototype machine with elemental technologies under development, verification tests were performed on places that represented disaster sites, and a certain level of performance was confirmed. This prototype looks like an ordinary hydraulic excavator, but, specifically, has the following elemental technologies:

- [3]Quickly and stably controlling heavy power machines with high inertia by achieving target values regarding location and speed through fine tuning and by controlling pressures on a cylinder at high speeds.
- [4]Estimating external load of multiple degree of freedom (DOF) hydraulically-driven robot from oil pressure of each hydraulic cylinder. The estimated force will be used for force control or force feedback to the operator of tele-operated rescue robots.
- [5]Measuring high frequency vibration by a force sensor installed at the forearm[2] of the robot and giving the operator vibrotactile feedback.
- [6]Flying a multi-rotor unmanned aircraft vehicle UAV ("drone") to the place of the operator's choice and obtaining image information. Long flights and pin-point landing[3] of the drone are available due to power supply through electric lines and a power-feeding helipad[4] for tethering[5] the drone.
- [7]Presenting the operator images of an overhead view from an arbitrary place by using 4 fish-eye cameras mounted on the robot in real time so that the operator can assess the area surrounding the robot.

▪ [8]Using a far-infrared ray camera[6] capable of viewing with long-wavelength light[7] so that the operator can operate the robot while assessing the situation even under bad weather conditions like fog.

[9]In addition to the above-mentioned[8] technologies, this group is developing several useful elemental technologies and making efforts to improve their technical performance. They are also developing new robots with a double rotation mechanism and double arms with the purpose of achieving higher operability and terrain adaptability.

***Notes to the text:***
***1 – помощь***
***2 – предплечье***
***3 – высокоточная посадка***
***4 – вертолетная площадка с электропитанием***
***5 – привязывание***
***6 – камера дальнего инфракрасного излучения***
***7 – длинноволновой свет***
***8 – вышеупомянутые***

**Ex. 3.14. Answer the questions.**

1. What did a group of Japanese researchers develop?
2. How does the prototype machine look like?
3. How was it tested?
4. How many elemental technologies does the rescue robot have?
5. Why are rescue robots tele-operated?
6. How does the operator get vibrotactile feedback?
7. What are unmanned aircraft vehicles used for?
8. How does the operator get images of an overhead view?
9. How can the operator assess the situation under bad weather conditions?
10. What new robots are the researchers developing now?

**Ex. 3.15. Say whether the statements are true of false. Correct the false ones.**

1. The prototype construction robot differs little from conventional construction machines.
2. Verification tests were performed on places that represented disaster sites.
3. Research leaders at Osaka University refused to take part in the development of the robot.
4. The heavy power machines have high inertia.
5. The operator of remote-control rescue robots has no force feedback.
6. The drone is capable of long flights and pin-point landing
7. The operator can fully assess the area surrounding the robot.
8. The group of researchers is making efforts to improve the technical performance of elemental technologies.

**Ex. 3.16. Join the halves of the sentences.**

| | |
|---|---|
| 1. Construction robots for disaster relief were developed | a. power through electric lines and a power-feeding helipad for tethering the drone. |
| 2. The prototype machine with elemental technologies under development | b. are achieved through fine tuning. |
| 3 Target values regarding location and speed | c. demonstrated a certain level of performance. |
| 4. Controlling pressures on a cylinder at high speeds | d. helps to control the machines. |
| 5. Oil pressure of each hydraulic cylinder helps | e. in order to solve various challenges of conventional construction machines used in such situations. |
| 6. Drones are supplied with | f. to estimate external load of multiple degree of freedom |

**Ex. 3.17. What is your opinion of remote-control rescue robots? Are they better than human-operated machines? Why? / Why not?**

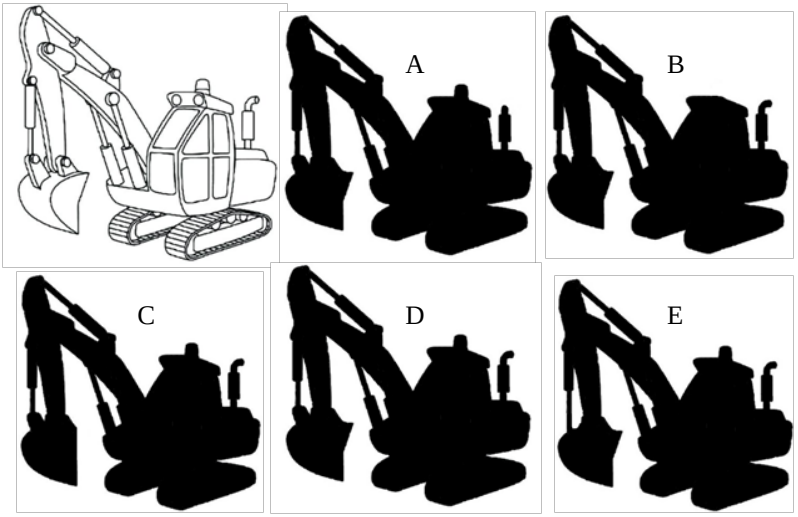
**Ex. 3.18. Which of these areas do you think will benefit the most from robotization: industry, agriculture, construction, trade, transport, communications, service sector? Rank them.**

## Fun with excavators

**Ex. 3.19. Moving across and down find 10 hidden words related to excavators.**

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| q | e | r | d | f | g | b | n | m | p | g | h | a | l | m | d | b | q |
| u | n | d | e | r | c | a | r | r | i | a | g | e | f | z | a | o | i |
| z | f | b | e | x | z | w | g | i | u | e | g | t | a | c | d | o | a |
| a | b | q | w | i | n | c | h | i | j | j | e | y | b | s | q | m | l |
| e | a | f | k | l | s | i | v | d | m | g | a | u | k | t | s | p | h |
| o | c | z | q | u | c | m | u | n | t | e | r | w | e | i | g | h | t |
| j | k | x | f | p | l | r | m | j | a | c | i | a | l | c | h | l | a |
| p | h | t | b | u | c | k | e | t | w | z | n | e | i | k | o | t | n |
| m | o | y | n | b | f | j | k | h | i | n | g | e | z | p | j | l | k |
| n | e | s | z | f | h | k | l | o | q | r | l | z | a | y | w | g | x |

**Ex. 3.20. Find the shadow of the excavator.**




## UNIT 4

**This unit will introduce you to draglines – specialized excavators operated by pulling the bucket towards the boom. What words do you need to understand the information about them?**

**Ex. 4.1. Read the vocabulary attentively and fill in the lines with the words of the categories given below. Refer to figure 1 at page 39.**

***Dragline parts:***

_____
_____
_____

***Dimensions:***
***(измерения)***

_____
_____
_____
_____

***Actions:***
***(verbs)***

_____
_____
_____
_____

## Vocabulary

dragline [ˈdræglaɪn] – драглайн
civil engineering [ˌsɪv(ə)l endʒɪˈnɪərɪŋ] – строительство
canal dredging [kəˌnæl ˈdredʒɪŋ] – дноуглубительные работы
suspended [səˈspendɪd] – подвешенный
wire [ˈwaɪə] rope – проволочный канат
to manoeuvre [məˈnu:və] – перемещать (ковш драглайна)
chain [tʃeɪn] – цепь
hoist rope – подъемный канат
drag rope – тяговый канат
to power – приводить в действие
hoist coupler [ˈkʌplə] – опрокидной блок
drag coupler – соединительное звено
to draw [drɔ:] – тащить, тянуть
swing operation – поворот на выгрузку
dumping place – отвал (место выгрузки)
to release [rɪˈli:s] – ослабить; отпустить
to tilt – опрокидываться
dump operation – выгрузка
to throw [θrəʊ] – забрасывать (ковш)
winding up [ˌwaɪndɪŋ ˈʌp] – подтягивание (с помощью лебедки)
jib [dʒɪb] – стрела
clutch [klʌtʃ] – зажим
to swing – качать(ся), раскачиваться; поворачиваться
walking excavator – шагающий экскаватор
foot – опора, лапа (шагающего экскаватора)
caterpillar [ˈkætəpɪlə] track – гусеничная лента
pressure [ˈpreʃə] – давление
to reposition [ˌri:pəˈzɪʃ(ə)n] – переставлять
limitation [ˌlɪmɪˈteɪʃ(ə)n] – ограничение
height [haɪt] – высота
length [len(k)θ] – длина
depth [depθ] – глубина

**Ex. 4.2. Read the first sentence of each paragraph of the text and put the headlines in the correct order.**

___ Dragline bucket system
___ Use of draglines
___ Walking draglines
___ Typical excavation cycle
___ Limitations of draglines
___ Throwing the bucket

**Ex. 4.3. Look through paragraphs 2, 5, and 6 of Text A, and then answer the questions in one sentence or phrase.**

1. How is the bucket manoeuvred?
2. How do walking draglines accomplish their movement?
3. What is the speed of their movement?
4. What are the primary limitations of draglines?

**Ex. 4.4. Read the text carefully to understand the construction and operations of draglines.**

## Text A: Draglines

[1]A dragline excavator is a piece of heavy equipment used in civil engineering and surface mining[1]. In civil engineering, draglines are used for road, port construction, and canal dredging.

[2]A dragline bucket system consists of a large bucket which is suspended from a boom with wire ropes. The bucket is manoeuvred by means of a number of ropes and chains. The hoist rope, powered by large diesel or electric motors, supports the bucket and the hoist coupler from the boom. The dragrope is used to draw the bucket horizontally. By skilful manoeuvre of the hoist and the drag ropes the bucket is controlled for various operations. A schematic of a large dragline bucket system is shown below.

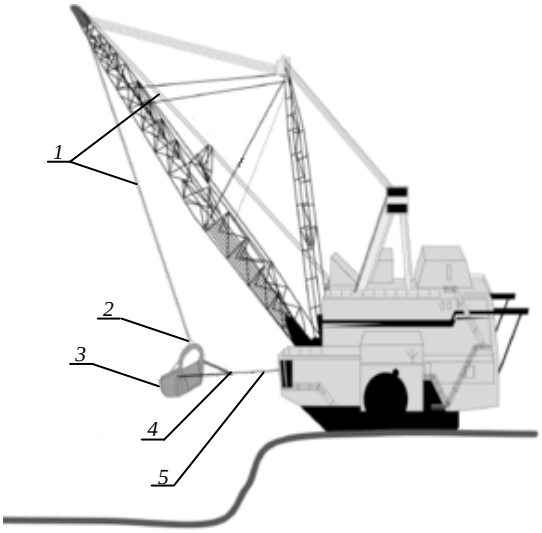



Fig. 1. Dragline bucket system:
*1* – hoist rope; *2* – hoist coupler;
*3* – dragline bucket; *4* – drag
coupler; *5* – drag rope

[3]In a typical cycle of excavation, the bucket is positioned above the material to be excavated. The bucket is then lowered and the dragrope is then drawn so that the bucket is dragged along the surface of the material. The bucket is then lifted by using the hoist rope. A swing operation is then performed to move the bucket to the dumping place. The dragrope is then released causing the bucket to tilt and empty. This is called a dump operation.

[4]The bucket can also be thrown by winding up to the jib

and then releasing a clutch on the drag rope. This would then swing the bucket like a pendulum[2]. Once the bucket had passed the vertical, the hoist cable would be released thus throwing the bucket. On smaller draglines, a skilled operator could make the bucket land about one-half the length of the jib further away than if it had just been dropped. On larger draglines, this is not a common practice.

[5]All but[3] the smallest of draglines are walking excavators. The movement is accomplished by using feet, as caterpillar tracks place too much pressure on the ground, and have great difficulty under the weight of the dragline. Maximum speed is only at most a few metres per minute since the feet must be repositioned for each step. If travelling medium distances, (about 30–100 km), a special dragline carrier can be brought in to transport the dragline.

[6]The primary limitations of draglines are their boom height and boom length, which limits where the dragline can dump the waste material. Another primary limitation is their dig depth, which is limited by the length of rope the dragline can utilize. Inherent with their construction[4], a dragline is most efficient excavating material below the level of their base[5]. While a dragline can dig above itself, it does so inefficiently and is not suitable to load piled up material.

***Notes to the text:***

***1 – разработка месторождений полезных ископаемых открытым способом***

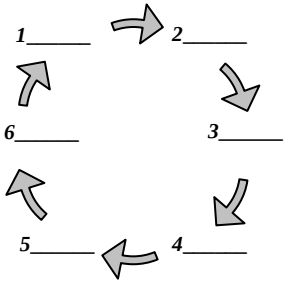
***2 – маятник***

***3 – кроме***

***4 – в силу своей конструкции***

***5 – уровень стоянки экскаватора***

**Ex. 4.5. Find the right place in the excavation cycle for each operation listed below.**




swinging back

lifting the bucket

lowering the bucket

dumping the load

swinging the loaded bucket

filling the bucket

**Ex. 4.6. How is the dragline bucket controlled? Fill in the gaps with the words from the box to complete the description.**

| dragged | manoeuvred | jib | the dumping place |
|---|---|---|---|
| the hoist and the drag couplers | tilt | thrown | released |

The dragline bucket is _____ with the help of ropes and chains. The hoist and the drag ropes are connected through _____ to the chains attached to the bucket.

The bucket can be _____ to the digging position by winding up to the _____ and then releasing a clutch on the drag rope. The bucket is then _____ along the surface of the material and lifted with the hoist rope. The bucket is moved to _____ by swinging the boom. The dragrope is then _____ which makes the bucket _____ and empty.

**Ex. 4.7. Replace the Russian words with the English ones to outline the characteristics of the dragline:**

1. In (*строительство*), the dragline can be used for digging trenches and canal dredging.
2. When handling mud[1], the dragline bucket (*подвешенный*) from a boom with wire ropes is the most practical attachment.
3. The bucket is positioned above the material to be excavated by releasing the (*тяговый и подъемный канаты*).
4. The angle of the (*стрела*) for dragline operations should normally be from 25 to 35 degrees.
5. The (*глубина выемки*) of a dragline is limited by the length of its rope.
6. In walking draglines the caterpillar tracks are replaced by (*опоры*).

_____

1 – черпание грязи

**Ex. 4.8. Correct the false statements using the information from the text.**

1. The use of draglines is limited to canal dredging.
2. A dragline bucket system includes a bucket with an arm.
3. Manoeuvring the bucket doesn't require any special skills.
4. The drag rope isn't used in the excavation cycle.
5. Throwing the bucket far from the jib is a common practice on large draglines.
6. Small draglines are usually walking excavators.
7. The feet of walking draglines place too much pressure on the ground.
8. Repositioning the feet allows draglines to travel 3-100 km.

**Ex. 4.9. Answer the questions.**

1. How is the hoist rope powered? What does it support?
2. What is the drag rope used for?
3. How is tilting and emptying the bucket named?
4. What is the effect of releasing the clutch on the drag rope after winding the bucket to the jib?
5. Why do walking draglines move slowly?
6. Do draglines dig more efficiently below or above the level of their base? Why?

**Ex. 4.10. Write brief instructions "How to operate a dragline". Make use of the expressions given below.**

*Position the bucket ...*
*Lower ...*
*Draw ...*
*Lift ...*
...
...

**Ex. 4.11. Learn the words before reading text B.**

to emerge [ɪ'mɜːʤ] – появляться
blasted rock – взорванная порода
open-cut coal mine – угольный разрез
to spare [speə] – избавлять (от чего-л.)
strain [streɪn] – нагрузка
achievement [ə'ʧiːvmənt] – достижение
to deliver [dɪ'lɪvə] – доставлять
spoil pile – отвал, террикон
smooth [smuːð] – плавный
wear and tear [ˌweə̲r ən 'teə̲] – износ
to account [ə'kaun̲t] for – приходиться (на долю)
fragmented [fræg'mentɪd] – раздробленный
resemblance [rɪ'zembləns] – сходство
to retrofit ['retrəufɪt] – дооснащать, дооборудовать; модернизировать
improvement [ɪm'pruːvmənt] – улучшение; увеличение
to gain [geɪn] – получать; достигать
to trial ['traɪəl] – испытывать, подвергать испытанию
pedal ['ped(ə)l] – педаль
lever ['liːvə] – рычаг
coalface ['kəʊlˌfeɪs] – угольный забой

**Ex. 4.12. Choose the word that best fits the blank.**

1. Vegetation doesn't grow on this type of _____ (strain / spoil pile).
2. Millions of tons of _____ (blasted rock / open coal mine) were used to reclaim the land for the islands.
3. Isometric power shovel is used for digging and loading earth or _____ (fragmented / smooth) stones.
4. The power regulator functions similar to a gas _____ (lever / pedal) in a car.
5. There is less _____ (wear and tear / coalface), which increases the longevity of the buildings.
6. Computers _____ (deliver / account for) 5% of the country's commercial electricity consumption.

**Ex. 4.13. Look through the text and find the words having the same meaning as:**

- to appear *(paragraph 2)*
- success *(paragraph 4)*
- similarity *(paragraph 9)*
- to modernize *(paragraph 10)*
- to obtain *(paragraph 11)*
- to test *(paragraph 12)*

**Ex. 4.14. Read the text and do the tasks that follow.**

## Text B: Australian Scientists Develop World's Largest Robot

***[1]A team of Australian scientists is developing the world's largest industrial robot – a massive beast[1] 75 metres tall, weighing 3500 tonnes and able to devour[2] 150 tonnes of rock in a single bite[3].***

[2]The giant robot is emerging from research designed to install a computer "brain" in a dragline, the huge walking crane with a 100-metre-long boom, used to scoop up blasted rock in open-cut coal mines.

[3]A team from the Co-operative Research Centre for Mining Technology and Equipment (CMTE) and CSIRO Manufacturing Science and Technology, is devising a computerised system that will automate part of the operations of the dragline, improving productivity and sparing both operator and equipment strain.

[4]Their world-first achievement has attracted international scientific attention, and was recently featured[4] by US space agency NASA in its "Cool Robot of the Week" web site.

[5]"A dragline picks up from 100 to 300 tonnes of fragmented rock with every scoop, then swings it round and delivers it to the spoil pile, then swings back again," explains CSIRO researcher Dr Jonathan Roberts.

[6]"It also swings back and forth once a minute, so the smoother and more efficient you can make the operation, the less wear and tear on the machine, the more rock is moved and the less strain on the dragline's human operator."

[7]The aim of the project is to automate the parts of the operation where the dragline carries its full load from the pick-up point to the dump point, and then returns to collect a new bucketful.

[8]"We liken[5] it to cruise-control in a motor vehicle. It will offer the operator the option of automating the repetitive parts of the process, which account for up to 80 per cent of operating time, allowing him to focus on the more challenging and skilled tasks."

[9]It also has some resemblance to the autopilot in a passenger jet aircraft – especially as a dragline, at $60-100 million, costs about the same as a commercial jet.

[10]"The dragline is essentially 1950s technology. It's fairly low-tech. What we're doing is retrofitting it with a brain," Dr Roberts explains.

[11]It has been estimated that increasing the productivity of a dragline by around 4 per cent, which may not sound all that much – would save the typical Australian coal mine $3 million a year, or $280 million for Australia as a whole. Any productivity improvements gained using the automated swing control system have yet to be quantified[6], but it is hoped that 4 per cent is possible.

[12]The system is being trialled on a dragline located at Tarong Coal's Meandu Mine, near Kingaroy, in Queensland.

[13]Latest tests have demonstrated co-ordinated computer control of the hoist, drag and swing functions and placement of the 40 tonne bucket gently[7] on the ground, ready for loading, with the computer moving the dragline's pedals and levers.

[14]"We were able to move this particular machine, which weighs 3500 tonnes, just using a computer mouse!" Dr Roberts says.

[15]The dragline's human operator "teaches" his robot partner the exact places where the coalface and spoil pile are using a joystick. The computer memorises them and then performs the operation more smoothly than its human mentor[8]. In time, says Dr Roberts, they may be able to add a radar sensor to the boom to help the computer locate its targets.

***Notes to the text:***

***1 – зверь***

***2 – проглотить***

***3 – укус***

***4 –представлено***

***5 – сравниваем***

***6 – количественно оценить***
***7 – аккуратно***
***8 – инструктор***

**Ex. 4.15. Answer the questions.**

1. Who is developing the world's largest industrial robot?
2. What is the robot emerging from?
3. How many tonnes of fragmented rock can a dragline pick up with every scoop?
4. Where is the rock delivered?
5. What is the aim of the project?
6. What two electronic systems does the achievement of the Australian scientists resemble?
7. How much will the productivity of a dragline increase?
8. Where is the new system being trialled?
9. What have the latest tests demonstrated?
10. Who "teaches" the robot?

**Ex. 4.16. Say whether the statements are true of false. Correct the false ones.**

1. The robot is 85 metres tall.
2. The robot weighs 2500 tonnes.
3. The world-first achievement has attracted international scientific attention.
4. A dragline swings back and forth once in 10 minutes.
5. The repetitive parts of the process account for up to 80 per cent of operating time.
6. A dragline costs about the same as a commercial jet.
7. The dragline is fairly high-tech.
8. The innovation could save the typical Australian coal mine $3 million a year.
9. The machine can be moved just using a computer mouse.
10. The computer can't memorize where the coalface and spoil pile are.

**Ex. 4.17. Join the halves of the sentences.**

| | |
|---|---|
| 1. A computerised system will automate part of the operations of the dragline, | a. the operator to focus on the more challenging and skilled tasks." |
| 2. The achievement was recently featured by US space agency NASA | b. have yet to be quantified. |
| 3. Automating the repetitive parts of the process will allow | c. improving productivity and sparing both operator and equipment strain. |

4. Any productivity improvements gained using the automated swing control system
5. The computer performs the operation
6. In time, they may be able to add a radar sensor to the boom

d. more smoothly than its human mentor.
e. to help the computer locate its targets.
f. in its “Cool Robot of the Week” web site.

**Ex. 4.18. Do you think the dragline really needs a brain? Why? / Why not?**

**Ex. 4.19. Can a computer program ever replace the human brain?**

## Fun with draglines

**Ex. 4.20. Moving across and down find 8 hidden words related to draglines.**

| w | q | e | t | n | g | r | d | m | n | l | o | z | x | v | b | o | s |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| i | g | l | u | w | z | g | a | v | c | h | a | i | n | d | m | c | l |
| q | p | e | d | a | l | p | x | o | i | a | p | u | y | n | q | l | m |
| e | h | v | e | z | t | l | e | q | q | c | z | d | l | w | l | u | n |
| g | r | e | q | p | n | d | r | e | d | g | i | n | g | p | y | t | y |
| b | m | r | v | w | a | v | j | i | k | u | r | i | l | t | x | c | g |
| i | v | u | s | t | e | z | b | n | b | e | x | f | j | u | f | h | x |
| a | l | l | o | r | w | u | j | u | r | g | i | o | l | p | p | i | j |
| g | p | r | e | s | s | u | r | e | f | f | z | o | m | e | l | q | i |
| f | u | j | l | w | q | p | c | y | t | w | r | t | r | w | y | x | b |

**Ex. 4.21. Find the odd word in each line.**

1) bulldozer excavator minivan scraper
2) achievement strain improvement success
3) to maneuver to reposition to move to power
4) limitation height length depth
5) bucket hopper chain bowl
6) to draw to tilt to throw to retrofit

## UNIT 5

**The equipment presented in this unit includes excavating machines designed for making trenches in the ground. What words do you need to understand their description?**

**Ex. 5.1. Read the vocabulary carefully and find the words that can be put into the following groups:**

Types of trenchers: _____
Trencher parts: _____
Characteristics of parts: _____
Actions (*verbs*): _____

### Vocabulary

trencher – траншеекопатель, траншейный экскаватор; канавокопатель
wheel ~ – роторный траншеекопатель
chain-type ~ – цепной траншеекопатель
portable [ˈpɔ:təb(ə)l] ~ портативный траншеекопатель
to lay [leɪ] – укладывать, прокладывать
~ pipes [paɪps] – укладывать трубы
~ cables – укладывать кабели
to install drainage [ɪns,tɔ:l ˈdreɪnɪdʒ] – укладывать дренаж
implement [ˈɪmplɪmənt] – орудие
access ['ækses] – доступ
width [wɪdθ] – ширина
hardness [ˈh□ɖnəs] – прочность, твёрдость
rock wheel – фрезерный траншеекопатель; скальная фреза
toothed [tu:θt] wheel – (роторное) колесо с зубьями
to operate – эксплуатировать
to maintain [meɪnˈteɪn] – обслуживать; содержать в исправности
mounted [ˈmaʊntɪd] on tracks – на гусеничном ходу
mounted on rubber tires [ˌrʌbə ˈtaɪəz] – на пневмоколесном ходу
design [dɪˈzaɪn] – конструкция
variable [ˈvɛərɪəb(ə)l] – регулируемый

densified [ˈdensɪfaɪd] – усиленный
manually [ˈmænjʊəlɪ] – вручную
to adjust [əˈdʒʌst] – устанавливать; регулировать
removable [rɪˈmu:vəb(ə)l] – съёмный; сменный
heavy use [ju:s] – интенсивное использование
digging chain – режущая цепь
boom – рама (цепного траншеекопателя)
conveyor [kənˈveɪə] belt – ленточный конвейер
reversible [rɪˈvɜ:səb(ə)l] – реверсивный
dimensions [daɪˈmenʃ(ə)nz] – размеры
conventional [kənˈvenʃ(ə)n(ə)l] – стандартный
drainage pipe feeder [ˈfi:də] unit – устройство подачи дренажных труб
backfiller [ˈbækfɪlə] – оборудование для обратной засыпки траншей; канавозасыпщик

**Ex. 5.2. Look through the text and name the numbers of the paragraphs in which these things are mentioned:**

a) width and depth of the trench;
b) hardness of the surface;
c) trenchers mounted on rubber tires;
d) tools easily changed manually;
e) heavy use of the machine;
f) conventional trench digging equipment.

**Ex. 5.3. Read the text carefully to learn about the configurations and functions of trenchers.**

## Trenchers

[1]A trencher is a piece of construction equipment used to dig trenches, especially for laying pipes or cables, for installing drainage.

[2]Trenchers come in different sizes and may use a different digging implement, depending on the required width and depth of the trench and the hardness of the surface to be cut.

[3]A wheel trencher or rock wheel is composed of a toothed metal wheel. It is cheaper to operate and maintain and can cut harder ground than chain-type trenchers. Thanks to the wheel it is possible to work in hard or soft soils. They are also used to cut pavement for road maintenance and to gain access to utilities[1] under roads. Wheel trenchers may be mounted on tracks or rubber tires.

[4]Due to its design the wheel can reach variable cutting depths while keeping a constant soil working[2] angle with a relatively small wheel

diameter. This reduces the weight and therefore the pressure to the ground and the height of the unit for transport.

[5]Last but not least advantage is offered by the cutting elements. These segments (6 to 8 depending on the diameter) which are placed around the wheel have the teeth which are more or less densified depending on the ground that they will encounter. These tools which can be easily changed manually allow the operator to adjust different cutting width on the same wheel. The teeth are placed in a semi spherical configuration in order to increase the removal of the materials from the trench. The teeth on the wheel are removable and made of high strength steel or cemented carbide. When the machine is under heavy use, the teeth may need to be replaced frequently, even daily.

[6]A chain trencher cuts with a digging chain that is driven around a rounded metal frame, or boom. This type of trencher can cut ground that is too hard to cut with a bucket-type excavator. This type of trencher can cut narrow and deep trenches. The angle of the boom can be adjusted to control the depth of the cut. To cut a trench, the boom is held at a fixed angle while the machine moves slowly. The excavated materials can be removed by a conveyor belt reversible either on the right or on the left.

[7]A micro trencher is a small rock wheel specially designed for work in urban area. It is fitted with a cutting wheel that cuts a microtrench with smaller dimensions than can be achieved with conventional trench digging equipment. The trench dimensions are widths ranging from about 30 mm to 130 mm, and a maximum depth of about 500 mm. These machines are sometimes radio-controlled. With a micro trencher, the structure of the road is maintained and there is no associated damage to the road. Owing to the reduced trench size, the volume of waste material excavated is also reduced.

[8]There are also portable trenchers. They may be used to install irrigation lines. These machines are lightweight (around 200 pounds) and are easily maneuverable compared to other types of trenchers.

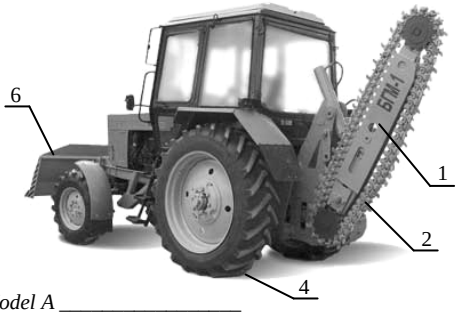
[9]A trencher may be combined with a drainage pipe feeder unit and backfiller, so a drain may be placed and the trench filled in one pass.

***Notes to the text:***

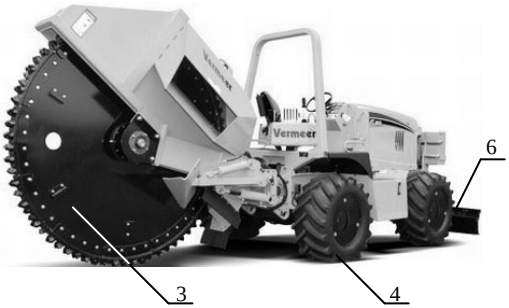
***1 – инженерные коммуникации***

***2 – разработка грунта***

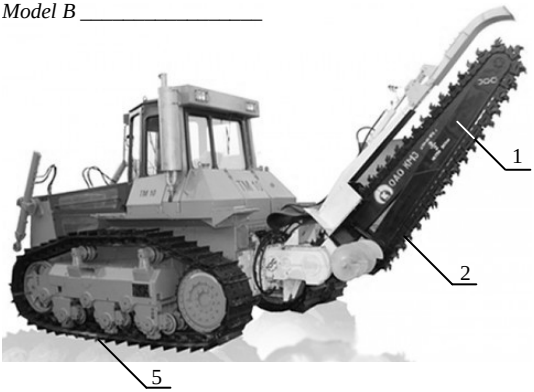
**Ex. 5.4. Look at the pictures and indentify the type of trenchers (wheel or chain-type), and then label their parts with the words from the box. Do these trenchers have any backfilling attachments?**




*Model A* _____




*Model B* _____




*Model C* _____

rubber tires
blade
digging chain
boom
toothed wheel
tracks

**Ex. 5.5. Put each word in the correct blank to get a short description of trenchers.**

1) **installing drainage / trencher**

A _____ digs trenches for laying pipes or cables, for _____.

2) **implement / hardness**

Depending on the _____ of the surface to be cut, trenchers may use a different digging _____.

3) **wheel / chain-type**

A _____ trencher is cheaper to operate and maintain than _____ trenchers.

4) **rubber tires /rock wheel**

A _____ may be mounted on tracks or _____.

5) **boom / digging chain**

A chain trencher cuts with a _____ that is driven around a _____.

6) **excavated materials / conveyor belt**

A _____ reversible either on the right or on the left removes the _____.

**Ex. 5.6. What are the characteristics of different types of trenchers? Match the parts of the sentences referring to the text.**

| | | |
|---|---|---|
| | | replacing the teeth almost every day. |
| The design of the wheel | cannot cut | the operator to reach variable cutting depths. |
| The teeth on the wheel | are | at a fixed angle while the machine moves slowly cutting a trench. |
| A machine under heavy use | allows | more or less densified depending on the ground that they will encounter.. |
| The boom | can be | removable and made of cemented carbide or high strength steel. |
| Conventional trench digging equipment | is held | a trench with small dimensions like microtrenchers can. |
| | requires | easily changed manually allowing the operator to adjust different cutting width on the same wheel. |

**Ex. 5.7. What have you learned about trenchers? Replace the words printed *in italics* with the right words from the box.**

| | | |
|---|---|---|
| manually | boom | backfillers |
| drainage | maintained | design |

1. Trenchers are often used when used when installing *a system of pipes for removing excess water*.
2. These machines can dig narrow and deep trenches thanks to their *arrangement of parts*.
3. In chain trenchers, the angle of the *rounded metal frame* can be adjusted to control the cutting depth.
4. The desired excavation attachment position can be changed *by hands*.
5. Fitting trenchers with *implements for returning soil and other materials to the trench after it was dug* reduces the number of machines on the site.
6. Trenchers, like any other machine, should be *kept in good condition by making repairs* if they are to perform at their peak level.

**Ex. 5.8. Add some more details to the information given below. Use the words in brackets and make changes if necessary.**

1. Trencher teeth can cut a very hard surface. (*densified*)
2. A conveyor belt effectively deposits the excavated material on either side of the trench. (*reversible*)
3. When a trencher operates it is necessary to backfill the trench. (*conventional*)
4. In urban areas, microtrenches are cut in the road or pavement. (*dimensions*)
5. Trenchers with GPS systems are capable of the precise and accurate installation of cable and utility lines. (*mounted*)
6. Trenchers are often used in land reclamation. (*drainage pipe feeder units*)

**Ex. 5.9. Answer the questions.**

1. What is the main tool of the trencher?
2. What does the choice of digging implements depend on?
3. What kind of undercarriage do trenchers have?
4. What type of trenchers is usually used in road maintenance? Why?
4. Why are the teeth on the wheel removable?
5. What kind of ground can a chain trencher cut?
6. How are the excavated materials removed from the trench in a chain trencher?
7. Where are microtrenchers used?
8. What are the dimensions of microtrenches?

9. Where are portable trenchers used? What are their advantages over other types of trenchers?

10. Why are trenchers widely used in construction?

**Ex. 5.10. Trenchers are considered dangerous equipment. Work out safety rules for their operation. Make use of the expressions given below and add your own ones.**

*- Do not leave the trencher unattended with the engine running*
*- Wear safety goggles and a hard hat while operating*
*- Do not smoke or operate near flames or sparks*
- ...
- ...

**Ex. 5.11. Learn the words before reading text B.**

to launch [lɔːnʧ] – выпускать
to boost [buːst] – повышать
range [reɪnʤ] – ряд; спектр
return on investment – окупаемость инвестиций
sewer ['suːə] – канализация
underdrain installations [ˌɪnstə'leɪʃ(ə)nz] – закрытые дренажные установки
pipeline distribution – разводка трубопроводов
heavy-duty – предназначенный для работы в тяжёлом режиме (в тяжёлых условиях)
to tackle – работать с
fleet [fliːt] – парк (машин)
hydrostatic [ˌhaɪdrə(u)'stætɪk] trencher-chain drive – гидростатический цепной привод траншеекопателя
infinitely variable ['ɪnfɪnətlɪ 'veərɪəb(ə)l] displacement motor – бесступенчато регулируемый двигатель
contractor [kən'træktə] – подрядчик
modular ['mɒdjulə] design – модульная конструкция
patent-pending [ˌpeɪt(ə)nt 'pendɪŋ] – ожидающий выдачи патента
purpose-built [ˌpɜːpəs'bɪlt] – специальный, специального назначения
to enhance [ɪn'hɑːns] – увеличивать, повышать
to enable [ɪ'neɪbl] – давать возможность, позволять
feasible ['fiːzəbl] – выполнимый, осуществимый
hydraulic quick-disconnect blocks – гидравлические быстроразъемные блоки

uneven [ʌn'i:v(ə)n] – неровный
suspension [sə'spenʃ(ə)n] – подвеска
to mount [maunt] – монтировать, устанавливать; крепиться
power sliding cab – раздвижная кабина с электроприводом
to feature ['fi:ʧə] – характеризоваться, отличаться
visibility [ˌvɪzəˈbɪləti] – видимость; обзор
job site – рабочая площадка
air-ride suspension seat – сиденье с пневматической подвеской
dual ['dju:əl] – двойной
one-piece – цельный
hood [hud] – капот
routine maintenance [ru:'ti:n 'meɪnt(ə)nəns] – текущее техническое обслуживание
daily service – ежедневное обслуживание
inspection – осмотр, проверка

**Ex. 5.12. Tick (✓) the sentence that uses the underlined part correctly.**

1 ___ **A** Artificial intelligence will increasingly replace a <u>range</u> of jobs performed by people today.

___ **B** The <u>sewer</u> provided people with fresh water to drink and fish to eat.

2 ___ **A** A <u>contractor</u> is a person who helps the poor, especially by giving them money

___ **B** Michael Jones owns a <u>fleet</u> of taxis.

3 ___ **A** The house you want is down at the <u>suspension</u> of the street.

___ **B** Underwater <u>visibility</u> here is more than 20 meters.

4 ___ **A** Many drivers never look under the <u>hood</u>.

___ **B** Washington is the <u>job site</u> of the USA.

5 ___ **A** Subsurface water under roadways is collected in specialized <u>underdrain installations</u>.

___ **B** <u>Routine maintenance</u> is the cause of the engine failure.

6 ___ **A** This structure is easy to dismantle as it is <u>one-piece</u>.

___ **B** This <u>heavy-duty</u> version supports extra weight when needed.

**Ex. 5.13. Look through the text and find the words having the same meaning as:**

- to increase *(paragraph 1)*
- to work with *(paragraph 3)*
- special *(paragraph 5)*
- to make it possible *(paragraph 5)*
- realizable *(paragraph 5)*
- examination *(paragraph 11)*

**Ex. 5.14. Read the text and do the tasks that follow.**

## Text B: Ditch Witch launches its largest trencher yet

[1]Ditch Witch has introduced the HT275, its largest trencher to date, which is designed to boost productivity and versatility on a broad range of trenching jobs.

[2]The machine was designed to increase year-over-year[1] return on investment on water, sewer, gas, power and underdrain installations, pipeline distribution and other heavy-duty trenching tasks.

[3]The HT275 is built to tackle installations up to 3 metres deep and 66 cm wide. A fully utilized Cummins 275-hp Tier 4 engine provides the power required for a variety of digging conditions. As well, a hydrostatic trencher-chain drive with an infinitely variable displacement motor allows operators to easily match chain speeds to soil conditions.

[4]"Designed specifically for heavy-duty trenching, the HT275 is an excellent addition to the fleet of any underground construction contractor working on a broad range of trenching jobs," said Steve Seabolt, Ditch Witch product manager for heavy duty trenchers.

[5]"Modular and patent-pending designs and purpose-built attachments further enhance productivity and enable contractors to accept[2] a broader range of jobs than previously feasible."

[6]The HT275 includes four hydraulic quick-disconnect blocks that reduce the time it takes to change attachments from days to hours. The design allows operators to change rear attachments in the field without the use of heavy lifting equipment.

[7]Furthermore, for better performance on uneven terrains, the machine has a patent-pending suspension that mounts to the centre of each track frame.

[8]This innovative design feature provides the unique ability to float[3] each track independently, which takes stress off the main frame.

Equipped with a power sliding cab and featuring external cameras, the HT275 offers industry-leading[4] visibility of the job site, according to Ditch Witch.

[10]Operators also benefit from unparallelled[5] comfort and control due to an air-ride suspension seat with 270-degree rotation, ergonomic joystick controls and dual 18 cm displays.

[11]A one-piece, fully-opening hood offers easy access to the engine and all routine maintenance points. The HT275 also features a unique wireless remote that allows operators to perform daily service and inspections –

including advancing[6] the digging chain from ground level – saving time and simplifying maintenance.

[12]The trencher's patent-pending track frame is designed for easy removal, which further simplifies serviceability by minimizing time spent on track repairs.

***Notes to the text:***

***1 – по сравнению с предыдущим годом***

***2 – здесь: выполнять***

***3 – здесь: перемещать***

***4 – лучший в отрасли***

***5 – непревзойденный***

***6 – выдвижение***

**Ex. 5.15. Answer the questions.**

1. What kind of machine has Ditch Witch introduced?
2. What was the machine designed for?
3. What kind of engine is the HT275 equipped with?
4. What enhances the productivity of the HT275?
5. What is the advantage of hydraulic quick-disconnect blocks?
6. Why does the machine have better performance on uneven terrains?
7. What unique ability does the machine have?
8. Why does the HT275 offer improved visibility of the job site?
9. What provides unparallelled comfort for operators?
10. Why is the engine easily accessible?

**Ex. 5.16. Say whether the statements are true of false. Correct the false ones.**

1. The HT275 is built to tackle installations up to 5 metres deep and 86 cm wide.
2. The HT275 is designed specifically for heavy-duty trenching.
3. Steve Seabolt is one of Ditch Witch sales assistants for heavy duty trenchers.
4. The design of the HT275 enables contractors to accept a broader range of jobs than previously feasible.
5. Ergonomic joystick controls and dual 18 cm displays make the operator's job more difficult.
6. A unique wireless remote allows operators to perform daily service and inspections saving time.
7. The remote doesn't allow operators to advance the digging chain from ground level.
8. The trencher's track frame is difficult to remove.

**Ex. 5.17. Join the halves of the sentences.**

| | |
|---|---|
| 1. Ditch Witch launches | a. of any underground construction contractor working on a broad range of trenching jobs |
| 2. A hydrostatic trencher-chain drive with an infinitely variable displacement motor allows operators | b. to change rear attachments in the field without the use of heavy lifting equipment. |
| 3. The HT275 is an excellent addition to the fleet | c. its largest trencher yet. |
| 4. The design allows operators | d. takes stress off the main frame. |
| 5. The unique ability to float each track independently | e. simplifies serviceability by minimizing time spent on track repairs. |
| 6. The trencher's patent-pending track frame | f. to easily match chain speeds to soil conditions. |

**Ex. 5.18. Do you think the HT275 is an innovative product? Why do you think so?**

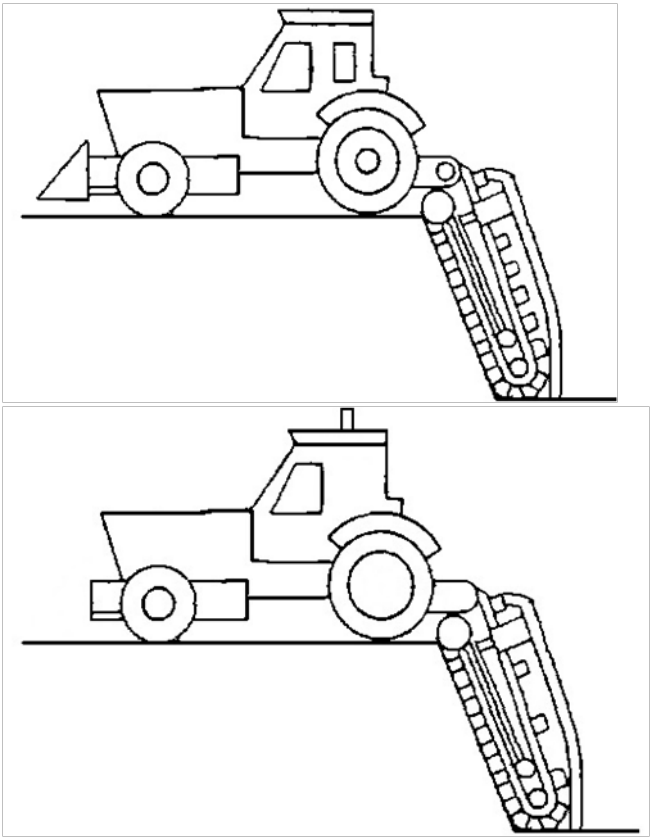
**Ex. 5.19. What are the latest trends and innovations in earthmoving machines? Consult the Internet if necessary.**

## Fun with trenchers

**Ex. 5.20. Moving across and down find 8 hidden words related to trenchers and their work.**

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| d | e | s | i | g | n | i | o | p | m | b | w | a | q | c | t | m | c |
| z | e | s | q | u | h | j | l | w | r | q | z | p | t | k | g | g | i |
| x | b | l | g | j | s | u | s | p | e | n | s | i | o | n | m | y | n |
| c | o | u | y | c | b | m | i | t | q | t | u | l | q | v | p | z | t |
| v | o | d | c | z | f | b | a | c | k | f | i | l | l | e | r | p | r |
| b | m | n | g | a | d | f | e | r | l | w | x | c | q | y | d | e | a |
| n | l | h | p | d | q | n | o | l | r | q | f | h | r | o | n | q | c |
| q | i | m | p | l | e | m | e | n | t | p | l | o | e | r | k | m | t |
| m | k | w | q | x | r | t | g | k | p | h | q | o | s | i | s | l | o |
| p | y | r | w | q | x | g | h | d | t | r | p | d | z | x | d | b | r |

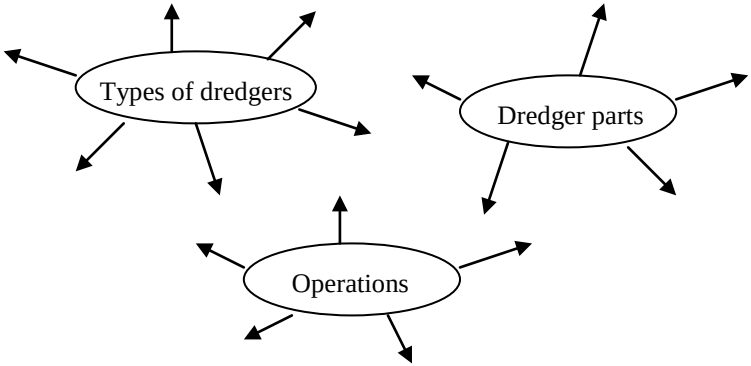
**Ex. 5.21. Find 7 differences in these two pictures.**



## UNIT 6

**You are to learn about machines capable of underwater earthmoving. What words do you need to understand their construction and functions?**

**Ex. 6.1. Read the vocabulary attentively and find the words that belong to these categories:**




**Vocabulary**

dredging [ˈdredʒɪŋ] – подводная выемка грунта; землечерпательные работы; дноуглубительные работы
~ vessel [ˈves(ə)l] – судно для разработки грунта под водой
shallow [ˈʃæləʊ] – мелкий, неглубокий
bottom sediments [ˌbɒtəm ˈsedɪmənts]– донные отложения
waterway – водный путь; фарватер
navigable [ˈnævɪgəb(ə)l] – судоходный
spoil – вынутый грунт; отвал
dredge [dredʒ] – устройство для для разработки грунта под водой
device [dɪˈvaɪs] – устройство, приспособление
scraping [ˈskreɪpɪŋ] – вычерпывание
sucking [ˈsʌkɪŋ] – всасывание
dredger [ˈdredʒə] – судно для разработки грунта под водой
suction [ˈsʌkʃ(ə)n] ~ – землесосный снаряд (земснаряд)
plain [pleɪn] suction ~ – земснаряд со свободным всасыванием
trailing [ˈtreɪlɪŋ] suction hopper ~ – самоотвозный земснаряд с волочащимся всасывающим пульпопроводом
cutter suction ~ – земснаряд с фрезерным рыхлителем грунта
auger suction ~ – земснаряд с шнековым рыхлителем грунта
bucket-line [ˈbʌkɪtlaɪn] ~ – многочерпаковый землечерпальный снаряд (землечерпалка)
backhoe ~ землечерпалка с ковшом «обратная лопата»
clamshell [ˈklæmʃel] ~ – грейферная землечерпалка

tube [tju:b] – труба
suction pipe – всасывающий пульпопровод
hopper – трюм
disposal area [dɪs,pəʊz(ə)l ’ɛəɾɪə] – гидроотвал ( место размещения вынутого грунта)
hull [hʌl] – корпус судна
to pump out [,pʌmp ’aʊt] – выкачивать
to self-offload [,self,ɒf’ləʊd] – саморазгружаться
suction inlet [’ɪnlet] – всасывающее отверстие
to discharge [dɪs'ʧɑ:ʤ] – выгружать, сбрасывать (грунт)
wear-resistant [,wɛərɪ’zɪst(ə)nt] – износоустойчивый
centrifugal [,sentrɪ’fju:g(ə)l] pump – центробежный насос
pipe line – пульпопровод; трубопровод
barge [bɑ:dʒ] – шаланда
crane [kreɪn] ~ – плавучий кран
hydraulic [haɪ’drɔ:lɪk] arm – гидрострела

**Ex. 6.2. What kinds of information do you think are mentioned in the text given below? Look through the text and tick (✓) what you have found:**

a) keeping waterways navigable;
b) dredging hard surfaces;
c) shallow water dredging;
d) bay mud[1] excavation;
e) repairing dredgers;
f) history of dredgers.

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ил в заливе

**Ex. 6.3. Look through paragraphs 1, 5, 6 and 9, and then answer the questions in one word or phrase.**

1. What does the process of dredging create?
2. What helps dredgers to self-offload?
3. What kind of pump is used in cutter dredgers?
4. Where do backhoe dredgers load the excavated material?

**Ex. 6.4. Read the text to understand in detail the description of dredger types and their work.**

## Text A: Dredging Vessels

[1]Dredging is an excavation activity or operation usually carried out at least partly underwater, in shallow seas or fresh water areas with the purpose of gathering up bottom sediments and transporting them to a different location. This technique is often used to keep waterways navigable. The process of dredging creates spoils, which are carried away from the dredged area.

[2]A dredge is a device for scraping or sucking the seabed, used for dredging. A dredger is a ship or boat equipped with a dredge.

[3]Types of dredgers:

[4]Suction dredgers operate by sucking through a long tube. A plain suction dredger has no tool at the end of the suction pipe to disturb[1] the material. This is often the most commonly used form of dredging.

[5]A trailing suction hopper dredger (TSHD) trails its suction pipe when working, and loads the dredge spoil into one or more hoppers in the vessel. When the hoppers are full, the TSHD sails to a disposal area and either dumps the material through doors in the hull or pumps the material out of the hoppers. Some dredges also self-offload using conveyors.

[6]A cutter suction dredger's (CSD) suction tube has a cutting mechanism at the suction inlet. The cutting mechanism loosens the bed material and transports it to the suction inlet. The dredged material is usually sucked up by a wear-resistant centrifugal pump and discharged either through a pipe line or to a barge. Cutter suction dredgers are most often used in geological areas consisting of hard surface materials where a standard suction dredger would be ineffective.

[7]An auger suction dredger functions like a cutter suction dredger, but the cutting tool is a rotating Archimedean screw[2]. Auger dredges are used for a wide variety of applications including river maintenance and sand mining.

[8]A bucket-line dredger excavates and raises material with many circulating buckets attached to a chain.

[9]A backhoe dredger has a backhoe like on some excavators. A backhoe dredger can be made by mounting a land-type backhoe excavator on a pontoon. There are also barge-mounted excavators. Backhoe machines are mainly used in shallow water. The dredged material is usually loaded in barges.

Fig. 2. Clamshell dredger

[10]A clamshell dredger picks up seabed material with a clamshell bucket, which hangs from a crane barge, or is carried by a hydraulic arm, or is mounted like on a dragline. This technique is often used in the excavation of bay mud.

***Notes to the text:***

***1 – здесь: разрыхлять***

***2 – архимедов винт***

**Ex. 6.5. What do you know about dredging after reading the text? Match the terms with their definitions.**

| | |
|---|---|
| 1) dredge | A) a long tube for transporting gathered sediments |
| 2) spoils | B) the part of a ship where dredged material is placed |
| 3) hopper | C) a large low flat-bottomed boat used for carrying excavated material |
| 4) hull | D) the main body of a ship |
| 5) pipe line | E) excavated bottom sediments |
| 6) barge | F) a device which scrapes or sucks the seabed |

**Ex. 6.6. Fill in the blanks with the words from the box to outline the configurations of dredgers:**

| | | |
|---|---|---|
| clamshell dredger | auger dredger | backhoe dredger |
| centrifugal pump | plain suction dredger | cutter suction dredger |

1. A _____ creates the vacuum for sucking material from bodies of water.
2. A _____ utilizes an open pipe to suck material from the bottom surface without the use of a mixing device.
3. A _____ uses a rotating cutter device to loosen bed material where it is sucked up.
4. An _____ uses an Archimedean screw to loosen material and push it toward the inlet of a suction pipe.
5. A _____ works very similar to land-based excavators.
6. A _____ picks up bay mud with a clamshell bucket, hanging from a crane barge.

**Ex. 6.7. Add some details to the statements using the words in brackets and making changes if necessary.**

1. Dredgers can be classified according to the type of equipment they use. (*vessel*)
2. In suction dredgers, a pump provides the flow for transferring the material through a pipe line to its disposal area. (*wear-resistant*)
3. Trailing suction hopper dredgers can dump the material at a new location. (*hull*)
4. Some TSHDs are equipped with conveyors. (*to self-offload*)
5. The depth of water is an important factor for backhoe dredgers. (*shallow*)
6. Auger dredges can be used to mine sand and maintain rivers. (*navigable*)

**Ex. 6.8 Learn more information about dredgers. Translate the passage given below into Russian.**

In general dredgers come in two basic forms: mechanical and hydraulic. Mechanical dredgers work by mechanically digging or gathering sediments from the bottom surface of a body of water typically through the use of a bucket or clamshell. Hydraulic dredgers work by sucking up a mixture of sediment and water from the bottom surface and then transferring the mixture through a pipeline to a desired location. Dredgers are used to move a wide variety of materials. Some examples are mud, sand, gravel, and gold. Dredges help to keep canals, ports and harbors clean. Dredgers even help to restore beaches and land lost due to erosion.

**Ex. 6.9. Answer the questions.**

1. What is dredging?
2. What is the difference between a dredge and a dredger?
3. Where are dredgers used?
4. What are the two main types of dredging equipment?
5. Can you name the examples of mechanic and hydraulic dredgers?
6. What kind of material can dredgers move?
7. What is the most common form of dredging?
8. What are the limitations of plain suction dredgers?
9. How can the dredged material be transported?
10. Do self-propelled dredgers have any advantages over stationary ones?

**Ex. 6.10. In several sentences, give an extended definition of dredging equipment for a glossary. It should include the basic parts of a formal definition (class + characteristics) as well as additional information such as its functions and uses. Examples, descriptions, or comparisons may also be included in your definition. Make use of the expressions given below and add your own ones.**

*A dredger is ...that / which ...*

*.... may be classified into ... types ...*

*For example, ... / ... such as ...*

**Ex. 6.11. Learn the words before reading text B.**

mighty ['maɪtɪ] – мощный; могучий
settling pond – отстойник

cooling pond – пруд-охладитель
tailing pond – хвостовой пруд (для хранения радиоактивных, токсичных и других отвальных отходов обогащения полезных ископаемых, именуемых хвостами)
dredge cage – клетка земснаряда
setup – устройство
agitator ['ædʒɪteɪtə] – мешалка
to guide [gaɪd] – управлять
shore [ʃɔː] – берег
floating ['fləutɪŋ] – плавучий
on-site – на месте эксплуатации; на объекте
obstacle ['ɔbstəkl] – препятствие
consistent pace – постоянная скорость
to take turns – делать что-л. по очереди
recovery cycle – цикл извлечения
slurry mixture [ˌslʌrɪ 'mɪkstʃə] – гидросмесь, пульпа
pumping rate – скорость откачки
density – плотность
volute [və'luːt] – спиральная камера, улитка (центробежного насоса)
amperage ['æmp(ə)rɪdʒ] draw – потребляемая сила тока
power output – выходная мощность
drive system – приводная система
to monitor – отслеживать, контролировать
discharge site – место сброса (грунта)
to draw in – всасывать
to decrease [dɪ'kriːs] – уменьшать
solids – твердые частицы
to increase – [ɪn'kriːs] – увеличивать
to lengthen ['leŋ(k)θən] – удлинять
standard dredge package – стандартный комплект земснаряда
to custom fit – укомплектовать по индивидуальному заказу

**Ex. 6.12. Choose the word that best fits the blank.**

1. The GSD is a new series of heavy-duty, high-powered _____ (shore / agitator) pumps.

2. Holland Dredge Design delivers three types of _____ (floating / on-site) discharge pipelines.

3. Dartmouth engineering students design and build remote-controlled vehicles to navigate a difficult _____ (setup / obstacle) course.

4. _____ (Solids / Density) is the substance's mass per unit of volume.

5. The average _____ (slurry mixture / pumping rate) should be below 0.08 $m^3$ per day to stabilize the groundwater level.

6. A _____ (cooling pond / settling pond) is a shallow reservoir having a large surface area for removing heat from water.

**Ex. 6.13. Look through the text and find the words having the same meaning as:**

- powerful *(paragraph 1)*
- controlling *(paragraph 4)*
- constant speed *(paragraph 5)*
- disposal area *(paragraph 9)*
- to take in *(paragraph 9)*
- to reduce *(paragraph 9)*

**Ex. 6.14. Read the text and do the tasks that follow.**

## Text B: Mighty Pumps Corporation Operates Autonomous Dredge at Four Canadian Pond Projects

[1]In 2015, Canada Pump and Power developed two patents for an autonomous dredging system. Since 2017, the Mighty Dredge has been at work on four projects in settling, cooling and tailings ponds, where the dredge can maneuver unmanned on projects 24-hours a day.

[2]An 8-inch Mighty Dredge pump and a dredge cage are on display at a trade show[1]. Four winch lines will operate this setup. This pump includes an agitator.

[3]Jeremy Leonard, chief executive officer[2] of Canada Pump and Power, founded the company in 2010. He concentrated on developing innovative pumping and dredging equipment. The company still performs more traditional dredging work, but Mighty Pumps Corp. was established in 2011 and focused on the production of the Mighty Dredges, Mighty Pumps and Mighty Barges. The company started with barges, then pumps and now dredges. Technology growth in artificial intelligence, GPS and sensors has made automation possible for this equipment, Leonard said.

[4]"The dredge pump moves around underwater with a computer guiding three or more winches from shore or on floating barges on the surface to determine where the dredge cage is positioned and what direction it is moving in," Leonard said, of the first patent and dredging method. "This enables the dredge cage to move around the pond without requiring a vessel of any kind on the surface." An operator is not needed on-site to control the dredge; the computer can identify where the Mighty Dredge is in 3D and move it as required. "The Mighty Dredge is smart enough to stop if it hits an obstacle and go around it," Leonard said.

[5]The autonomous dredge can also remove material at a more consistent pace and longer than traditional operations. The winches take turns pulling and releasing to move the dredge a small amount at a time in unison, Leonard said. This allows the dredge to cut into new material without a recovery cycle, and the slurry mixture remains consistent without cycling water[3] between digging cycles.

[6]"If the dredge does run into a problem, it just stops and emails or calls to let the responsible party[4] know that the dredge is awaiting instructions," Leonard said.

[7]The second patent details how the system controls its pumping rate for certain sediment conditions.

[8]"The dredge pump measures the density of material in the volute by monitoring the amperage draw or power output on the drive system," Leonard said.

[9]For each project, the system is programmed to achieve a specific mixture[5] of water and material, whatever is required to be pumped effectively to the discharge site. Because the computer can identify the density of the material in the volute in real-time, it can slow down or speed up the winches to cause the dredge to draw in more water and decrease the density of the slurry or draw in more solids to increase density.

[10]The propulsion of the dredge cage is based on three or more winches. Leonard said the operations so far have typically used four. The number determines how close to shore the dredge can cut a particular pattern[6], like a square or circle.

[11]"We can vary the area being covered by lengthening the winch cables. To date, we have used cables up to 450 meters long (1,500 feet), but there is no technological reason why we could not cover a larger area," Leonard said. The engineering team can provide a standard dredge package, or custom fit a dredge for a particular application.

***Notes to the text:***

***1 – демонстрируются на торговой выставке***
***2 – главный исполнительный директор***
***3 – циклическая подача воды***
***4 – ответственная сторона***
***5 – определенная смесь***
***6 – определенный контур***

**Ex. 6.15. Answer the questions.**

1. What did Canada Pump and Power develop in 2015?
2. Where has the Mighty Dredge been at work since 2017?
3. What does the Mighty Dredge pump include?
4. What is Jeremy Leonard?

5. What did he concentrate on?
6. What did Mighty Pumps Corporation focus on?
7. Why has automation become possible for dredging equipment?
8. How does the dredge pump move around underwater?
9. What are the advantages of the autonomous dredge over traditional ones?
10. What happens if the dredge runs into a problem?
11. What is the propulsion of the dredge cage is based on?

**Ex. 6.16. Say whether the statements are true of false. Correct the false ones.**

1. The Mighty Dredge can maneuver unmanned on projects 20-hours a day.
2. Four winch lines will operate the 8-inch Mighty Dredge pump and the dredge cage.
3. Mighty Pumps Corp. started with barges, then pumps and now dredges.
4. An operator is needed on-site to control the dredge.
5. The Mighty Dredge is not smart enough to stop if it hits an obstacle and go around it
6. The system controls its pumping rate for certain sediment conditions.
7. For each project, the system is programmed to achieve a specific mixture of water and material.
8. The number of winches determines how close to shore the dredge can cut a particular pattern.

**Ex. 6.17. Join the halves of the sentences.**

| | |
|---|---|
| 1. The dredge pump measures the density of material in the volute | a. to cause the dredge to draw in more water and decrease the density of the slurry. |
| 2. The computer can identify | b. or custom fit a dredge for a particular application. |
| 3. The computer can slow down the winches | c. have typically used four winches. |
| 4. It can also speed up the winches | d. the density of the material in the volute in real-time. |
| 5. Leonard said the operations so far | e. to draw in more solids to increase the density of the slurry. |
| 6. The engineering team can provide a standard dredge package, | f. by monitoring the amperage draw or power output on the drive system. |

**Ex. 6.18. What are the prospects for dredging vessels? In what way are they likely to develop?**

**Ex. 6.19. Do you think computer-guided dredging equipment will completely replace traditional one?**

## Fun with dredgers

**Ex. 6.20. Moving across and down find 8 hidden words related to dredgers and their work.**

| t | y | q | s | p | o | i | u | y | t | r | e | z | q | a | f | d | v |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| n | m | d | p | z | x | w | z | q | m | n | y | b | t | e | w | d | l |
| m | f | l | o | a | t | i | n | g | q | s | k | a | j | h | d | l | n |
| o | s | q | i | t | r | w | q | z | x | c | v | r | f | o | j | m | v |
| h | u | l | l | g | h | s | u | c | k | i | n | g | w | l | k | p | o |
| z | u | p | r | h | n | m | t | u | k | p | m | e | l | h | l | q | l |
| x | g | y | h | u | s | b | d | g | h | l | b | d | j | m | p | r | u |
| c | a | c | a | g | i | t | a | t | o | r | d | e | s | w | e | c | t |
| v | g | y | q | v | d | e | g | w | n | m | r | t | c | r | a | n | e |
| b | n | m | j | k | u | l | w | q | d | f | g | h | j | k | l | o | z |

**Ex. 6.21. Find the odd word in each line.**

1) navigable closed travelable passable
2) device apparatus destruction gadget
3) cube tube pipe line
4) scraping sucking discharging guiding
5) hull hopper deck pump
6) to decrease to lengthen to enlarge to increase
7) settling pond swimming pond cooling pond tailing pond
8) obstacle difficulty hardship assistance

## UNIT 7

**You are to study mowers[1] – machines used in land reclamation[2]. What words do you need to understand their construction and functions?**

1– косилки; 2– мелиорация

**Ex. 7.1. Read the vocabulary attentively and choose the words belonging to the following categories:**

Types of mowers _____
Mower parts _____
Actions (*verbs*)_____
Characteristics (*adjectives*)_____

### Vocabulary

ganged [gæŋd] – секционный
cutting unit – режущий аппарат
three-point hitch – трёхточечное навесное устройство
trailer [ˈtreɪlə] – прицеп
mower [ˈməʊə] – косилка
boom ~ – манипуляторная косилка
disk ~ – ротационная косилка дискового типа
drum [drʌm] ~ – ротационная косилка с аппаратом барабанного типа
finger-bar ~ – пальцевая косилка
reciprocating ~ – возвратно-поступательная косилка
rotary [ˈrəʊt(ə)ri] ~ – ротационная косилка
sickle ~ – ножевая косилка
water ~ – водная косилка
to mow [ˈməʊ] – косить, обкашивать
steep [stiːp] – крутой
bank – берег
roadside [ˈrəʊdsaɪd] – обочина, придорожная полоса
sickle [ˈsɪk(ə)l] – нож режущего аппарата
~ section – сегмент ножа (ножевой сегмент)
reciprocating [rɪˈsɪprəkeɪtɪŋ] – совершающий возвратно-поступательное движение
bar – брус

finger-~ [ˈfɪŋgəbɑː] – пальцевый брус
sickle ~ – ножевой брус
triangular [traɪˈaŋgjʊlə] blade – треугольная пластина
guard ledger [ˈgɑːdˌledʒə] – противорежущая пластина, вкладыш пальца
finger-plate – противорежущая пластина, вкладыш пальца
swath [swɔːθ] – прокос
swathboard [ˈswɔːθbɔːd] – полевая доска, отвальная доска
to swivel [ˈswɪv(ə)l] – вращаться, поворачиваться
obstruction [əbˈstrʌkʃ(ə)n] – препятствие
rear-mounted [ˌrɪəˈmaʊntɪd] unit – задненавесной агрегат
self-powered – самоходный
mowing boat [bəʊt] – лодка-косилка
floating [ˈfləʊtɪŋ] – плавучий
underwater weeds [wiːdz] – сорная водная растительность

**Ex. 7.2. Look through the text and name the numbers of the paragraphs in which these things are mentioned:**

a) a three-point hitch;
b) visibility by the driver;
c) reciprocating mowers;
d) a finger-bar;
e) a swathboard;
f) disc mowers;
g) drum mowers;
h) floating machines.

**Ex. 7.3. Read the text carefully to learn about the configurations and functions of mowers.**

## Mowers

[1]A mower is a machine for cutting grass or other plants that grow on the ground but there are also aquatic mowers.

[2]Large mowers are usually ganged (equipped with a number of similar cutting units), so they can adapt individually to ground contours. They may be powered and drawn by a tractor. The cutting units can be mounted underneath the tractor between the front and rear wheels, mounted on the back with a three-point hitch or pulled behind the tractor as a trailer. There are also self-propelled mowers, which often have the cutting units mounted at the front and sides for easy visibility by the driver. Boom mowers are mounted on long hydraulic arms. This allows the tractor to mow steep banks or roadsides while remaining on a safer surface.

[3]Mower types:

[4]Sickle mowers, also called reciprocating mowers, or finger-bar mowers, have a long (typically six to seven and a half feet) bar on which are

mounted fingers with stationary guard ledgers. In a channel[1] on the finger-bar there is a reciprocating sickle with very sharp sickle sections (triangular blades). The sickle bar is driven back and forth along the channel. The grass, or other plant matter, is cut between the sharp edges of the sickle sections and the finger-plates.

[5]The bar rides on the ground, supported on a shoe with a skid at the inner and outer ends. The skids can be positioned higher or lower to adjust the height of the cut. A swathboard at the outer end of the bar guides the cut grass away from the uncut grass. The so-formed channel, between cut and uncut material, allows the inner shoe and the wheel to ride in the channel, and the mower cuts only uncut grass cleanly on the next swath.

[6]Rotary mowers can be of a disk or drum type. Disc ones have rapidly rotating disks mounted on a bar, with sharpened edges that cut the material. In rough cutting conditions the blades attached to the disks are swivelled to absorb blows from obstructions. Mostly these are rear-mounted units. Self-powered mowers of this type are used for rougher grass in land maintenance.

[7]Drum mowers have their horizontally-mounted cutting blades attached to the outside of a relatively large diameter disc fixed to the bottom of a smaller diameter drum and are principally designed for cutting lighter grass very quickly.

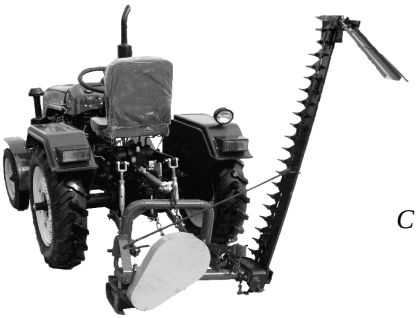
[8]Water mowers, or mowing boats, are developed to enable the maintenance of canals, lakes and rivers. They are large floating machines that have underwater cutting blades that cut the stems of underwater weeds, gather the plants and raise them on conveyor belts, storing the vegetation on board in a hold. Periodically this is discharged to a barge or an onshore facility[2].

***Notes to the text:***
***1 – желобок, выемка***
***2 – береговое сооружение***

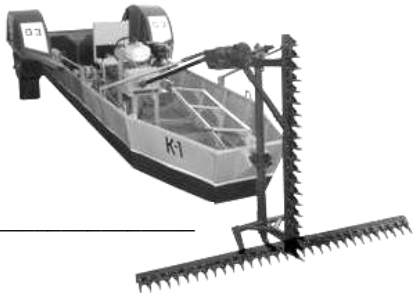
**Ex. 7.4. Match the types of mowers with the pictures (A-D).**

*A* _____

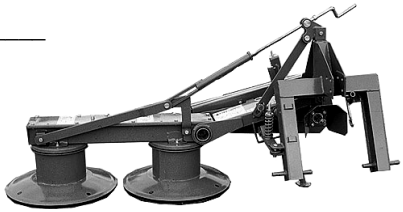
| |
|---|
| finger-bar mower |
| disc mower |
| drum mower |
| mowing boat |



*B* _____



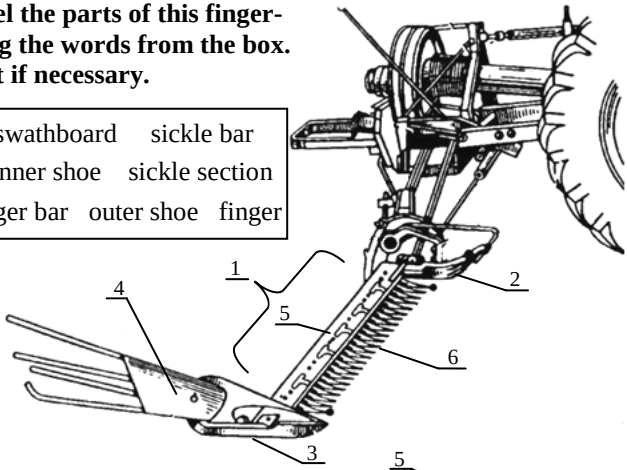
*C* _____

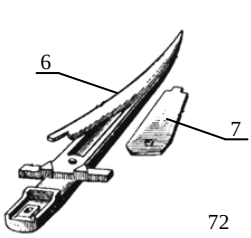


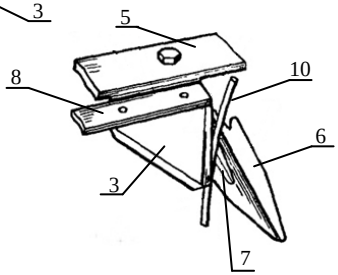
*D* _____

**Ex. 7.5. Label the parts of this finger-bar mower using the words from the box. Refer to the text if necessary.**

| | | |
|---|---|---|
| plant stalk | swathboard | sickle bar |
| guard ledger | inner shoe | sickle section |
| cutting unit | finger bar | outer shoe | finger |



**Ex. 7.6. Put each word or word combination in the correct blank to get an outline of the features and functions of mowers.**

1) **steep banks / boom mowers**

_____ are designed to cut grass in hard-to-reach places such as _____ .

2) **grassy roadsides / reciprocating mowers**

_____ are used in the maintenance of _____ .

3) **ganged mowers / uneven land**

In _____, the sections are articulate[1] and adjust to _____ .

4) **trailer /three-point hitch**

Some cutting units are mounted on the back with a _____ while others are pulled behind the tractor as a _____.

5) **self-powered / rear-mounted**

A _____ disc mower is an alternative to an expensive _____ mower.

6) **rougher / swivelled**

In _____ terrain, the blades can be _____ to absorb the shock of obstacles in the grass-plot.

7) **obstructions / visibility**

Exceptional _____ allows operators to get very close to _____ and reduces mowing over unwanted and damaging objects.

8) **underwater weeds / floating machines**

There are _____ that are specially developed for removing _____.

_____

1 – шарнирно соединены.

**Ex. 7.7. What have you learned about mower types? Fill in the gaps with the words from the box to complete the descriptions.**

| cut material | drums | sickle section | conveyance |
|---|---|---|---|
| finger plate | sickle section | edges | swath | sickle bar |

**A)** In *(1)* _____ mowers, the stems are divided into small portions, inserted into the spaces between adjacent fingers, and pushed by the sections to the fingers. Then the material is cut between a moving *(2)* _____ and a stationary *(3)* _____ .

*(4)* _____ edges can be smooth or serrated and can be re-sharpened or replaced. Guard ledger *(5)* _____ are usually serrated[1] on the underside and are not re-sharpened.

**B)** Drive mechanisms in disk mowers are located beneath the cutting blades to facilitate the *(6)* _____ flow through the machine. Disks

may be counter rotating[2] to deposite this material in rows or corotating[3] to make an even *(7)* _____.

**C)** Drum mowers are supported and driven from the top. Vertical cylinders (*(8)* _____) support the driving mechanism above the ground and cut at the ground level. The cut material passes through the narrow spaces between or under the drums, which increases energy required in material *(9)* _____.

_____

1 – зазубренный; 2 – вращаются в противоположном направлении; 3 – вращаются в одном направлении.

**Ex. 7.8. Answer the questions.**

1. What is a mower?
2. Why are large mowers ganged, as a rule?
3. How can the cutting units be attached to the tractor?
4. Why do boom mowers have long hydraulic arms?
5. What are the main types of mowers?
6. How is the grass cut in finger-bar mowers?
7. Why are disc blades swivelled in some rotary mowers?
8. What are drum mowers designed for?
9. What happens to the plants cut by mowing boats?

**Ex. 7.9. Say whether the following statements are true, false or not mentioned in the text.**

1. All mowers are tractor-drawn.
2. In sickle mowers, fingers with movable finger-plates are mounted on a bar.
3. The sickle bar is driven back and forth along the channel in the finger-bar.
4. Sickle sections are triangular blades.
5. The height of the cut is adjusted with the help of the shoe.
6. A swathboard forms a channel between cut and uncut material.
7. A finger-bar mower was an early type of machine for mechanised cutting of corn and grass.
8. Some disc models are designed to be mounted in double and triple sets on a tractor, one in the front and one at each side, thus able to cut up to 20 foot (6 metre) swaths.
9. In drum mowers, horizontally-mounted cutting blades are attached to the outside of a large diameter disc.
10. To reduce the high moisture content and to make it easier to transport, the harvested underwater weeds can be chopped and pressed.

**Ex. 7.10. Speak on how different types of mowers can help in road and canal maintenance.**

**Ex. 7.11. Learn the words before reading text B.**

current ['kʌr(ə)nt] – нынешний
owner ['əunə] – владелец
consumer [kən'sju:mə] – потребитель
to expand [ɪk'spænd ] – расширять(ся)
sales network – сеть продаж
wheel-steering technology – технология управления колесами
sliding frame – скользящая рама
control unit – блок управления
mowing blade – косильный нож
electromagnetic clutch – электромагнитная муфта
belt pulley ['pulɪ] – ременной шкив
to overlap [ˌəuvə'læp] – перекрывать(ся)
flange [flændʒ] – фланец
bolt [bəult] – болт
cutting deck – режущая дека
to facilitate [fə'sɪlɪteɪt] – облегчать
chain curtain – цепная завеса
rubber cover [ˌrʌbə 'kʌvə] – резиновая крышка
to prevent [prɪ'vent] – предотвращать
gear – шестерня
V-belt – клиновой ремень
integrated stabilizing winch – встроенная стабилизирующая лебедка
noise [nɔɪz] – шум
dam [dæm] – дамба, плотина
bank – берег

**Ex. 7.12. Replace the words printed *in italics* with the words from the word bank, which have the same meaning.**

| Word Bank | bank gears current noise<br>dam sales network flange bolts |
|---|---|

1. The report presents *being or existing at the present moment* trends in the European Union market for mowers.

2. In 1992, the joint *group of retailers, distributors, and agents who contribute to selling a product* of Volkswagen and Audi ceased to exist.

3. The *part that sticks out* around the wheels on railway trains helps to keep them on the rails.

4. Make sure the parts to be joined together are securely held with *long metal objects which are used to fasten things together*.

5. *Wheels with teeth that engage with the teeth of other wheels* can serve as an efficient means to reverse the direction of motion or change rotational speed.

6. Automotive companies conduct numerous tests to study the causes of *a loud or unpleasant sound*.

7. The *structure built across a stream or river to hold water back* led to flooding and erosion, thereby destroying traditional agriculture.

8. They fall down from the steep *slope bordering a river* regularly.

**Ex. 7.13. Look through the text and find the words having the same meaning as:**

- holder *(paragraph 1)*
- client *(paragraph 1)*
- to increase *(paragraph 1)*
- to overlay *(paragraph 5)*
- to make easy *(paragraph 6)*
- to avoid *(paragraph 6)*

**Ex. 7.14. Read the text and do the tasks that follow.**

### Text B: Robot Mowers Allow Hands-off Grass Care

[1]Spider Mower USA is an American, privately owned company and a subsidiary of Dvořák[1] Slope Mowers Ltd., the manufacturer of SPIDER mowers. Dvořák Slope Mowers was founded in 2004 by its current owner, Mr. Lubomír Dvořák. From its origins[2], the company was successful in launching a series of products that won the business[3] of many consumers throughout the USA, Europe, Asia and Australia. During the following decade, the Dvořák team created new mower models and expanded their sales network to nearly 50 countries. With this tremendous[4] success came the birth of the American-based company, Spider Mower USA.

[2]When it comes to steep slope mowers, SPIDER is simply a cut above the rest[5]. Each of the remote-controlled mower models offers a wide range of features and benefits and all of them are specially designed to keep operators safe while mowing dangerous slopes with angles up to 60 degrees from distances of up to 900 feet.

[3]The ILD02 SG SPIDER mower is a self-propelled machine with four-wheel drive, controlled by a transmitter (remote radio controller) signal. Its unique wheel-steering technology ensures a high manoeuvrability both on level ground and on slopes.

[4]The basic part of the machine is formed by a square solid frame, which is connected with a sliding frame. The middle part of the sliding frame carries all transmission parts such as the engine, the hydraulic pump, the

hydraulic motor and the control unit. 4 mowing blades are attached to the bottom part of the frame.

[5]An electromagnetic clutch is placed between the main belt pulley and the engine. Circles formed by the rotation of blades do not overlap. The blades are fixed and attached to the flanges by bolts.

[6]The cutting deck is open on two sides in order to facilitate the intake and discharge of grass. These openings are covered by a chain curtain and by a rubber cover, which prevent the throwing of undesirable objects. A steel bumper above the rubber cover on the outside of the mower marks the safe distance from the blades.

[7]Transmission is by chains and gears on all four wheels. The wheels are driven by two hydraulic motors through V-belts. Wheels are steered by an electric motor. The gel battery and the control unit are situated in the front part of the mower.

[8]The mower is operated by one person using radio control. The machine movement is controlled by two joysticks: forward/reverse and left/right.

[9]On the slopes where people can barely walk SPIDER feels at home. If the slope exceeds 40°, using the integrated stabilizing winch enables continuing without difficulties up to an incredible 55°.

[10]One of the many places where SPIDER can be seen is along roads and highways. These areas are quite dangerous and therefore SPIDER is an ideal solution as it can be operated from a safe distance using the remote control.

[11]Speed, ease of operation, quality of cut, low noise and efficiency are essential aspects for maintaining[6] parks and gardens. All of this SPIDER undoubtedly[7] provides.

[12]The low weight and the stabilizing winch enables mowing on dam walls or river banks with steep slopes and soft terrain.

[13]SPIDER mowers are easy to maintain, similar to any other traditional zero-turn mowers.

***Notes to the text:***

***1 – ['dvɔ:ʒæk] Дворжак (фамилия)***

***2 – с момента своего основания***

***3 – здесь: завоевали доверие***

***4 – огромный***

***5 – на голову выше остальных***

***7 – несомненно***

**Ex. 7.15. Answer the questions.**

1. When was Dvořák Slope Mowers founded?
2. Why is SPIDER a cut above any other steep slope mowers?

3. What ensures a high manoeuvrability of the machine?

4. What is the basic part of the machine is formed by?

5. How many mowing blades are attached to the bottom part of the frame?

6. What is placed between the main belt pulley and the engine?

7. What facilitates the intake and discharge of grass?

8. What kind of transmission does SPIDER have?

9. How is the mower is operated?

10. What is the maximum slope that the mower can cut?

**Ex. 7.16. Say whether the statements are true of false. Correct the false ones.**

1. Spider Mower USA is an American state owned company.

2. ILD02 SG SPIDER mower is a self-propelled machine with two-wheel drive.

3. Circles formed by the rotation of blades do not overlap.

4. Wheels are steered by an electric motor.

5. The machine movement is controlled by three joysticks.

6. SPIDER can be seen along roads and highways.

7. The machine can be used for maintaining parks and gardens.

8. SPIDER mowers are difficult to maintain.

**Ex. 7.17. Join the halves of the sentences.**

| | |
|---|---|
| 1. The company was successful | a. carries all transmission parts. |
| 2. The Dvořák team | b. and attached to the flanges by bolts. |
| 3. The middle part of the sliding frame | c. marks the safe distance from the blades. |
| 4. The blades are fixed | d. in launching a series of products that won the business of many consumers. |
| 5. A steel bumper above the rubber cover | e. are situated in the front part of the mower. |
| 6. The gel battery and the control unit | f. expanded their sales network to nearly 50 countries. |

**Ex. 7.18. What tasks do you think robot mowers can perform in agriculture?**

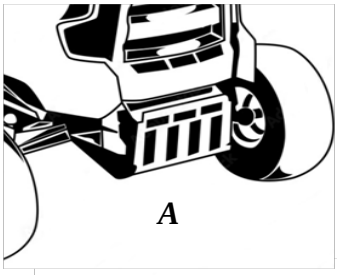
**Ex. 7.19. What are the advantages of self-driving combine harvesters? Are there any disadvantages? Consult the Internet if necessary.**

# Fun with mowers

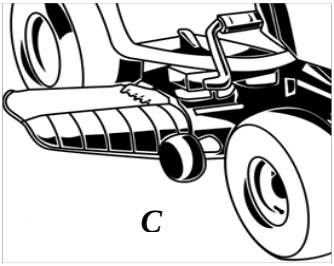
**Ex. 7.20. Moving across and down find 8 hidden words related to mowers and their work.**

| s | i | c | k | l | e | j | d | s | j | k | g | x | u | a | e | k | b |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| y | p | l | f | n | w | r | n | w | l | f | a | z | m | o | i | p | a |
| t | l | g | e | a | r | z | k | a | z | d | n | q | i | p | p | l | r |
| i | k | j | u | i | o | a | b | t | m | k | g | e | k | l | w | t | z |
| q | f | y | f | u | h | g | r | h | p | g | e | u | i | b | o | l | t |
| u | n | d | l | k | p | i | a | b | l | c | d | m | z | i | x | n | l |
| j | d | h | a | e | e | z | h | o | e | e | q | p | n | m | z | x | q |
| l | m | k | n | v | u | h | v | a | c | m | k | s | w | i | v | e | l |
| m | p | r | g | j | a | u | x | r | l | q | g | f | x | q | x | n | k |
| z | u | y | e | y | n | b | m | d | g | w | h | p | y | a | i | q | p |

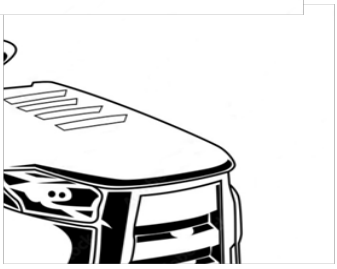
**Ex. 7.21. Put the parts of the picture (*A*–*D*) into the proper places (1–4) to make the correct view of the mower.**



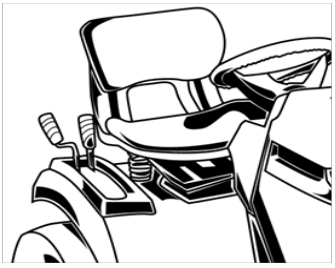
***A***



***C***



***B***



***D***

| | |
|---|---|
| 1 | 3 |
| 2 | 4 |

## UNIT 8

**You are to study sprinkling machines and installations – equipment used in crop irrigation[1]. What words do you need to understand their construction and functions?**

1– орошение с./х. культур

**Ex. 8.1. Read the vocabulary attentively and choose the words belonging to the following categories:**

Sprinkling equipment: _____
Types of nozzles: _____
Elongated structures and parts: _____
Watering range: _____
Actions (*verbs*): _____

## Vocabulary

sprinkling – дождевание, орошение дождеванием
~ device – дождевальный аппарат
~ installation – дождевальная установка
~ machine – дождевальная машина
centre pivot ['pɪvət] ~ machine – круговая дождевальная машина
lateral move ~ machine – фронтальная дождевальная машина
linear ['lmɪə] move ~ machine – фронтальная дождевальная машина
side-roll ~ machine – фронтальная дождевальная машина
plot – участок
portable ['pɔ:təbl] – переносной
operating unit – рабочий орган
nozzle ['nɔzl] – дождевальная насадка, сопло
spray ~ – распыливающий наконечник, разбрызгиватель
deflector ~– дефлекторная (от лат. *deflecto* – отклонять) насадка
centrifugal ~ – центробежная насадка
drop – капля
short-range – короткоструйный
medium-range – среднеструйный
long-range – дальнеструйный
watering range – дальность полива
cone [kəun] – конус
spiral duct ['spaɪər(ə)l ˌdʌkt] – винтовой канал
shaft [ʃɑ:ft] – ствол (дождевального аппарата)
axis ['æksɪs] – ось
spray – дождь (искусственный)
~ intensity – интенсивность дождя
output ['autput] – производительность
puddle ['pʌdl] – лужа
runoff ['rʌnɔf] – сток
watering – полив
stream [stri:m] – поток
positional type – позиционного действия (передвигаемые с позиции на позицию, где орошение проводится во время стоянки)
mobile ['məubaɪl] type – работающие в движении, мобильные
tube [tju:b] – труба
sectional distribution ~ – разборный распределительный трубопровод
hydrant ['haɪdr(ə)nt] – гидрант (водоразборный кран)
arm – крыло, консоль, штанга

sprinkling ~ – дождевальное крыло
to transfer [træns'fɜː] – переносить
irrigation [ˌɪrɪ'geɪʃ(ə)n] – орошение, полив
~ rate – норма полива
truss [trʌs] – ферма (стержневая система с узлами)
two-arm sprinkling ~ – двухконсольная дождевальная ферма
turret ['tʌrɪt] – башня
self-propelled caterpillar structure – самоходная гусеничная опора
rib – ребро
water pipe [paɪp] – водопроводящая труба
pipeline ['paɪplaɪn] – трубопровод
stub [stʌb] wing – открылок
annual ['ænjuəl] ditch – временный ороситель (канал для подачи воды, нарезаемый в почве перед началом поливного сезона)
to feed [fiːd] – подавать
pivot point – центр вращения

**Ex. 8.2. What kinds of information do you think are mentioned in the text given below? Look through the text and tick (✓) what you have found:**

a) functions of sprinkling machines and installations;
b) classification of sprinkling machines and installations;
c) structure of sprinkling machines and installations;
d) watering range;
e) advantages and disadvantages of different types of irrigation equipment;
f) history of irrigation equipment.

**Ex. 8.3. Read the text carefully to learn about the configurations and functions of sprinkling machines and installations.**

## Sprinkling Machines and Installations

[1]Sprinkling machines and installations are devices that are used for sprinkling agricultural crops. Sprinkling machines are mounted on a tractor or move independently through the plot being irrigated. Sprinkling installations are portable.

[2]The main operating units of sprinkling machines and installations are short-range spray nozzles (watering range of 5–8 m) and medium-range (15–35 m) and long-range (40–80 m) sprinkling devices.

[3]Nozzles do not have rotating parts. In deflector nozzles, which are the most common, the water is separated into drops upon striking a deflector (cone); in

centrifugal nozzles (with spiral ducts) the water is separated by centrifugal force. At low pressure, deflector and centrifugal nozzles provide a uniform spray with a drop diameter of 1–1.5 mm and an intensity of about 1 mm/min.

[4]Sprinkling devices consist of one or several shafts with nozzle tips that rotate around their vertical axis during watering. The stream of water, which is emitted from the tip at a speed of 20–30 m/sec and higher, is broken up into drops by the air. The size of the drops and the intensity of the spray may be controlled by attaching tips of different diameters and by varying the water pressure. Long-range devices have high output, but they produce a heavier spray than short-range nozzles; this results in the rapid formation of puddles and runoff. Medium-range devices are characterized by low spray intensity and small drop diameter, so they may be used for sprinkling at high irrigation rates.

[5]According to their principle of operation, sprinkling machines and installations are classified as positional and mobile types.

[6]Positional installations consist of a sectional distribution tube with hydrants and two sprinkling arms with short-range nozzles or medium-range devices. While one arm is operating, the second is transferred to a new position.

[7]Positional short-range sprinkling machines have a two-arm sprinkling truss attached to the turret of a self-propelled caterpillar structure. The lower rib of the arm is a water pipe (its outer end is connected to a hydrant of the pipeline) with stub wings to which nozzles are attached.

[8]Positional long-range sprinkling machines (trailer, tractor-mounted, and self-propelled) are equipped with a centrifugal pump that sucks water from an annual ditch and feeds it into long-range devices.

Fig. 3. Sprinkling machine

[9]Mobile sprinkling machines consist of a two-arm truss with short-range nozzles mounted on a tractor. Water is taken from an annual ditch by means of a centrifugal pump.

[10] According to the type of their movement, sprinkling machines can be classified as centre pivot or lateral move (linear move, side-roll) machines.

The first ones move in a circular pattern and are fed with water from the pivot point at the centre of the circle. The second ones are configured to move in a straight line, and the water is supplied by an irrigation channel running the length of the field.

**Ex. 8.4. Fill in the chart about sprinkling machines and installations.**

| The main operating units of irrigation equipment | The watering range of irrigation equipment | Types of irrigation equipment | |
|---|---|---|---|
| | | according to the principle of action | according to the type of movement |
| ➢ .....<br>➢ .....<br>➢ ..... | ➢ .....<br>➢ .....<br>➢ ..... | ➢ .....<br>➢ ..... | ➢ .....<br>➢ ..... |

**Ex. 8.5. Find words or phrases in the text which mean the following:**

1) movable (paragraph 1)
2) turning around (paragraph 3)
3) pond (paragraph 4)
4) tracked (paragraph 7)
5) automotive (paragraph 8)
6) designed (paragraph 10)

**Ex. 8.6. What have you learned about irrigation equipment? Match the terms with their definitions.**

| | |
|---|---|
| 1) installation | A) a small, circular tower |
| 2) nozzle | B) the degree or amount of strength or force that something has |
| 3) centrifugal | C) a complete mechanical apparatus fixed in position for use |
| 4) intensity | D) a vertical pipe that is connected to the main water system and can supply water |
| 5) hydrant | E) moving away from the centre |
| 6) turret | F) a narrow piece attached to the end of a tube or pipe so that the liquid that comes out can be directed in a particular way |

**Ex. 8.7. Fill in the blanks with the words from the box to outline the configurations of sprinkling machines and installations:**

| | | | |
|---|---|---|---|
| lateral move | sprinkling arm | centre pivot | output |
| deflector | spiral ducts | stub wings | |

1. In _____ nozzles the water is separated into drops upon striking a cone.

2. In nozzles with _____ the water is separated by centrifugal force.

3. Long-range devices have high _____ .

4. While one _____ is operating, the second is transferred to a new position.

5. The lower rib of the arm is a water pipe with _____ to which nozzles are attached.

6. _____ sprinkling machines move in a circular pattern.

7. _____ sprinkling machines move in a straight line.

**Ex. 8.8. Answer the questions.**

1. What is the function of sprinkling machines and installations?

2. What are the two main types of nozzles? Which one is the most common?

3. What is the size of drops provided by nozzles? What is the intensity of the spray?

4. What do sprinkling devices consist of?

5. What is the speed of water emitted by the nozzle of a sprinkling device?

6. What are the best devices for sprinkling at high irrigation rates?

7. What do positional installations consist of?

8. What do positional short-range sprinkling machines have?

9. What are positional long-range sprinkling machines equipped with?

10. What do mobile sprinkling machines consist of?

**Ex. 8.9. Say whether the following statements are true or false. Correct the false ones.**

1. Sprinkling machines cannot move independently through the plot being irrigated.

2. Sprinkling installations are portable.

3. Nozzles have many rotating parts.

4. The size of the drops and the intensity of the spray are impossible to control.

5. Long-range devices they produce a heavier spray than short-range nozzles.

6. Positional short-range sprinkling machines take water from an annual ditch.

7. Positional long-range sprinkling machines take water from a hydrant.

8. A centrifugal pump feeds mobile sprinkling machines from an annual ditch.

9. Centre pivot sprinkling machines are fed with water from the pivot point.

10. Side-roll machines are fed with water from an irrigation channel running the length of the field.

**Ex. 8.10. Speak on the advantages and disadvantages of spray nozzles and sprinkling devices. Make use of the expressions given below.**

*On the one hand …, but on the other hand …*
*This results in ...*
*There could be a problem with that.*
*So they may be used for ...*

**Ex. 8.11. Learn the words before reading text B.**

cropland – пахотная земля, пахотное угодье
profoundly [prə'faundlɪ] – очень, сильно; серьёзно
course [kɔːs] – ход; направление
well – колодец
gasoline ['gæs(ə)liːn] – бензин
aquifer ['ækwɪfə] – водоносный слой, водоносный горизонт (*почвы*)
irrigator [ˌɪrɪgeɪ'tə] – мелиоратор
labour-intensive [ˌleɪbərɪn'tensɪv] – трудоёмкий
seedbed preparation – подготовка пашни
row crop – пропашная культура
drought [draut] – засуха
to make a circuit of the field – объехать поле по кругу
gun-style sprinkler – дальноструйный дождевальный аппарат
to disassemble [ˌdɪsə'sembl] – разбирать; демонтировать
set-up – установка
evaporation [ɪˌvæp(ə)'reɪʃ(ə)n] – испарение
feed crop – кормовая культура
interstate highway ['haɪweɪ] – федеральная автострада
feedlot ['fiːdˌlɒt] – откормочная площадка
meatpacking plant – мясокомбинат
community [kə'mjuːnətɪ] – местное сообщество; населенный пункт
retailer ['riːteɪlə] – магазин розничной торговли
wage [weɪʤ] – заработная плата

property tax ['prɔpətɪ ˌtæks] – налог на недвижимость
finite ['faɪnaɪt] – ограниченный
natural recharge ['nætʃ(ə)r(ə)l ˌri:'ʧɑ:ʤ] – естественное пополнение
profitable ['prɔfɪtəbl] – прибыльный, выгодный

**Ex. 8.12. Choose the word that best fits the blank.**

1. _____ is caused by a lack of rainfall, causing serious water shortages (cropland / drought).
2. An _____ is a body of rock or sediment that is completely saturated with water (irrigator /aquifer).
3. ___ happens when a liquid substance becomes a gas (evaporation / set-up).
4. If a _____ wants to sell lots of a product then it is positioned on shelves at average eye level (community / retailer).
5. Nowadays the Belarusians more and more use the Swedish _____ saws, capable of cutting an enormous tree in a few minutes (well / gasoline).
6. A(n) _____ connects different states together (meatpacking plant / interstate highway).

**Ex. 8.13. Look through the text and find the words having the same meaning as:**

- totally *(paragraph 2)*
- direction *(paragraph 2)*
- time-consuming *(paragraph 4)*
- salary *(paragraph 9)*
- limited *(paragraph 10)*
- beneficial *(paragraph 11)*

**Ex. 8.14. Read the text and do the tasks that follow.**

## Text B: How Centre Pivot Irrigation Brought the Dust Bowl[1] Back to Life

[1]If you live in the Great Plains, sooner or later you'll get a question about those "crop circles" that can be observed from airplane windows during flights over the region. The answer is contained in the question: Put simply, they are circles of cropland.

[2]The circular pattern[1], however, is different from the regular patchwork [2] many people imagine traditional farm fields to be. The shape is the result of the centre pivot irrigation, a development of the post-World War II era that profoundly changed the course of American food production.

[3]By the late 19th century, farmers had started pumping groundwater from wells, first using power from windmills[3] and later from gasoline engines.

[4]Groundwater irrigation from the aquifer received a boost in the 1930s and 1940s, when pumps powered by automobile engines accessed water from greater depths. Irrigators laid pipes across fields of crops, with sprinklers spaced at intervals. The practice was labour-intensive, requiring a lot of workers to move the pipes for seedbed preparation, for cultivation of row crops, and for harvest.

[5]The 1930s also witnessed[4] a long drought across much of the country, which brought into question the suitability of the region for agriculture. It was during the "Dirty Thirties" that a portion of the region in Colorado, Kansas, Texas, and Oklahoma, suffering from extreme conditions, became known as the "Dust Bowl."

[6]In 1948, an innovative Nebraska farmer named Frank Zybach[5] developed a new type of sprinkler system, the centre pivot, which he patented in 1952. Placing the pump at the centre of the field next to a well, irrigation pipes supported by trusses were mounted on wheeled towers that could make a circuit of the field under their own power[6], leaving that distinctive circle pattern. Gun-style sprinklers sprayed water out from the pipes at set intervals, with smaller nozzles closest to the pivot and the largest nozzles at the end of the line. The system could cover 133 acres of a 160-acre field, and didn't have to be disassembled by workers when it was time to plant, till, or harvest.

[7]Ever more powerful motors allowed irrigators to increase the systems' scale, with the largest set-ups covering all but the corners of a 640-acre section of land. Over time, farmers positioned sprinkler nozzles closer to the ground, resulting in less evaporation.

[8]The centre pivot irrigation was a technological triumph – and it also transformed the agricultural geography of the country. With feed crops becoming available in the Great Plains and easily portable via the new interstate highway system, feedlots and meatpacking plants moved to the region.

[9]Water for irrigation and large-scale animal feeding didn't only grow crops and livestock, it gave life to the Great Plains communities that depended on agriculture. Families and labourers shopped at local retailers and deposited wages in local banks, keeping small towns alive, and irrigators paid the property taxes that sustained local governments. Centre pivot irrigation supported local high schools, clubs, churches, and a whole way of life that would have literally dried up if the fields were less productive.

[10]In recent years, it has become apparent[7] just how finite the Ogallala Aquifer is. While water levels have increased in some areas, in most parts of the aquifer they have declined at a rate faster than natural recharge – sometimes by a foot per year – because of production agriculture.

[11]In 2013, a group of farmers in Kansas created a 99-square mile conservation zone in which all participants reduced their water use. As one farmer stated, "We had to change the culture. We took water for granted." As of 2018, many of those who reduced their water use claimed that agriculture can be profitable even with reduced pumping. But efforts like these are the exception to the rule. The unwillingness to compromise short-term gain for long-term sustainability, of course, is just as American as the ingenuity that created centre-pivot irrigation the first place.

***Notes to the text:***

***1 – район пыльных бурь в США***
***2 – круговой рисунок***
***3 – обычное лоскутное шитье***
***4 – наблюдалась***
***5 – Зайбах ['zaɪbaːk]***
***6 – самостоятельно***
***7 – очевидно***

**Ex. 8.15. Answer the questions.**

1. What can be observed from airplane windows during flights over the Great Plains?
2. What does the circular pattern result from?
3. When did groundwater irrigation from the aquifer receive a boost?
4. When did the region witness a long drought?
5. Who developed the centre pivot type of sprinkler system? When?
6. How did gun-style sprinklers spray water out from the pipes?
7. What was the scale of the largest set-ups?
8. How did the centre pivot irrigation transform the agricultural geography of the country?
9. How did it give life to the Great Plains communities?
10. What happened in Kansas in 2013?

**Ex. 8.16. Say whether the statements are true of false. Correct the false ones.**

1. Traditional farm fields are like circles.
2. The centre pivot irrigation was a development of the post-World War II era.
3. By the late 18th century, farmers had started pumping groundwater from wells.

4. Pumps powered by automobile engines accessed water from greater depths.

5. The long drought of the 1950s brought into question the suitability of the region for agriculture.

6. Frank Zybach patented his invention in 1953.

7. The pump was placed at the centre of the field next to a well.

8. Wheeled towers could make a circuit of the field under their own power.

9. In recent years, it has become apparent that the Ogallala Aquifer is infinite.

10. All the farmers in the Dust Bowl are willing to reduce water use.

**Ex. 8.17. Join the halves of the sentences.**

| | |
|---|---|
| 1. Irrigators laid pipes | a. requiring a lot of workers to move the pipes for seedbed preparation. |
| 2. The practice was labour-intensive, | b. local high schools, clubs and churches. |
| 3. The system didn't have to be disassembled by workers | c. across fields of crops, with sprinklers spaced at intervals. |
| 4. Over time, farmers positioned sprinkler nozzles | d. closer to the ground, resulting in less evaporation. |
| 5. Centre pivot irrigation supported | e. water levels have declined at a rate faster than natural recharge |
| 6. In most parts of the aquifer | f. when it was time to plant, till, or harvest. |
| 7. Agriculture can be profitable | g. is typical of Americans. |
| 8. The unwillingness to compromise short-term gain for long-term sustainability | h. even with reduced water pumping. |

**Ex. 8.18. Do you think the Dust Bowl could survive without centre pivot irrigation? Why? / Why not?**

**Ex. 8.19. What are the latest trends in irrigation? Consult the Internet if necessary.**

## Fun with sprinkling machines

**Ex. 8.20. Moving across and down find 8 hidden words related to sprinkling machines and their work.**

| e | m | v | n | o | z | z | l | e | z | q | f | s | t | u | b | l | p |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| t | s | t | i | u | s | h | l | o | z | t | p | h | p | k | t | h | l |
| h | p | j | y | s | r | f | e | v | d | u | q | z | v | b | n | y | k |
| k | r | u | j | h | v | r | y | q | g | r | m | w | g | k | p | d | u |
| l | i | q | x | a | b | u | k | h | m | r | j | z | q | t | k | r | g |
| b | n | u | i | f | n | x | l | b | m | e | q | j | g | t | l | a | f |
| v | k | t | u | t | m | q | p | u | i | t | k | z | h | j | m | n | d |
| c | l | y | d | w | y | d | y | t | u | w | w | q | b | k | l | t | w |
| e | i | r | g | a | x | i | s | q | w | s | d | x | v | k | w | n | t |
| s | n | a | q | p | k | l | h | f | d | a | q | u | i | f | e | r | z |
| z | g | z | h | j | k | j | l | o | e | t | y | k | m | w | z | q | m |

**Ex. 8.21. Find the odd word in each line.**

1) plot place site drop
2) irrigator well driver builder
3) cone pyramid output cylinder
4) rib tube pipe duct
5) community set-up society people
6) profoundly greatly very portable
7) lateral centre pivot linear side-roll
8) short-range medium-range shooting range long-range

## VOCABULARY

**A**

access – доступ
account for – приходиться (на долю)
accuracy – точность
achievement – достижение
adjust – устанавливать; регулировать
agitator – мешалка
aid – помогать
air-ride suspension seat – сиденье с пневматической подвеской
amount – количество
amperage draw – потребляемая сила тока
angle – угол
annual ditch – временный ороситель (канал для подачи воды, нарезаемый в почве перед началом поливного сезона)
approximately – приблизительно
apron – заслонка (фартук) ковша скрепера
aquifer – водоносный слой, водоносный горизонт (*почвы*)
arbitrary – произвольно выбранный
arm – 1) стрела; 2) крыло, консоль, штанга
    hydraulic ~ – гидрострела
    sprinkling ~ – дождевальное крыло
assess – оценивать
avoid – избегать
axis – ось
axle – ось
    tri- ~ – трехосный

**B**

backfiller – оборудование для обратной засыпки траншей; канавозасыпщик
backhoe – обратная лопата
bank – берег
bar – брус
    sickle ~ – ножевой брус
barge – шаланда
    crane ~ – плавучий кран
belt pulley – ременной шкив
blade – отвал
    brush-rake ~ – отвал типа кустарниковые грабли
    bull ~ – усиленный отвал

strait ~ – прямой отвал
S-U ~ – полусферический отвал
universal ~ – сферический отвал
blasted rock – взорванная порода
bolt – болт
boom – 1) рама (цепного траншеекопателя); стрела (экскаватора)
mono ~ – монострела
knuckle ~ –поворотная стрела
hinge ~ – шарнирная стрела
triple-articulated ~ – трехсекционная стрела
boost – повышать
bottom sediments – донные отложения
bowl – ковш (скрепера)
bucket – ковш (экскаватора)
general purpose ~ – универсальный ковш
large capacity ~ – ковш большой вместимости

**C**

cab – кабина
power sliding ~ – раздвижная кабина с электроприводом
cable-operated excavator – экскаватор с канатным приводом
capability – возможность
capacity – 1) мощность; 2) объем
bucket ~ объем ковша
engine ~ мощность двигателя
caterpillar track – гусеничная лента
centre pin – центральная цапфа
centrifugal pump – центробежный насос
chain – цепь
~ curtain – цепная завеса
digging ~ – режущая цепь
challenge – сложная задача
civil engineering – строительство
cleanup – зачистка забоя
clutch – зажим
coalface – угольный забой
community – местное сообщество; населенный пункт
conditions – условия
conduct – проводить
cone – конус
confirm – подтверждать
consistency – постоянство

consistent pace – постоянная скорость
consumer – потребитель
contractor – подрядчик
control unit – блок управления
controls – средства управления
conventional – стандартный
conveyor – конвейер
~ arrangement – конвейерное устройство
~ belt – ленточный конвейер
cooling pond – пруд-охладитель
cost-cutting – экономичный, снижающий стоимость
counterweight – противовес
course – ход; направление
crawler – гусеничный трактор
cropland – пахотная земля, пахотное угодье
current – нынешний
curvature – кривизна
curve – кривизна
lateral ~ – поперечная кривизна
custom fit – укомплектовать по индивидуальному заказу
cut – выемка; котлован
cutting deck – режущая дека
cutting unit – режущий аппарат

**D**

densified – усиленный
depth – глубина
design – конструкция
device – устройство, приспособление
digging – выемка грунта; рытье; копание
digging chain – режущая цепь (траншеекопателя)
digging force – усилие резания (ковша экскаватора)
dimensions – размеры
disposal area – гидроотвал (место размещения вынутого грунта)
ditch – канава, ров
drainage ~ – дренажная канава
drag coupler – соединительное звено
drag rope – тяговый канат
dragging ability – тяговая способность
dragline – драглайн, канатный скребковый экскаватор
drainage pipe feeder unit – устройство подачи дренажных труб

draw – тащить, тянуть
dredge – устройство для для разработки грунта под водой
dredger – судно для разработки грунта под водой
backhoe ~ землечерпалка с ковшом «обратная лопата»
bucket-line ~ – многочерпаковый землечерпальный снаряд (землечерпалка)
clamshell ~ – грейферная землечерпалка
suction ~ – землесосный снаряд (земснаряд)
auger suction ~ – земснаряд с шнековым рыхлителем грунта
cutter suction ~ – земснаряд с фрезерным рыхлителем грунта
plain suction ~ – земснаряд со свободным всасыванием
trailing suction hopper ~ – самоотвозный земснаряд с волочащимся всасывающим пульпопроводом
dredging – подводная выемка грунта; землечерпательные работы
canal ~ – дноуглубительные работы
~ vessel – судно для разработки грунта под водой
drive – привод; передача || приводить в движение
final ~ – бортовая передача
dumping – выгрузка; разгрузка в отвал
dumping place – отвал (место выгрузки)

**E**

earthmoving – земляные работы || землеройный
earthworks – земляные работы
edge – кромка
cutting ~ – режущая кромка; нож ковша скрепера
efficient – эффективный
ejector – выталкиватель (породы из ковша скрепера)
electromagnetic clutch – электромагнитная муфта
emerge – появляться
empty – пустой
enable – давать возможность, позволять
engine – мотор, двигатель
~ capacity – мощность двигателя
enhance – увеличивать, повышать
ensure – обеспечивать
estimate – оценивать
evaporation – испарение
excavator – экскаватор
cable-operated ~ – экскаватор с канатным приводом

hydraulic~ – экскаватор с гидравлическим приводом, гидравлический экскаватор
walking ~ – шагающий экскаватор
expand – расширять(ся)
explore – исследовать
external – внешний

**F**

facilitate – облегчать
feasible – выполнимый, осуществимый
feature – характеристика; характеризоваться, отличаться
feed – подавать
feed crop – кормовая культура
feedback – обратная связь
feedlot – откормочная площадка
final drive – бортовая передача
fine tuning – точная настройка
finger-plate – противорежущая пластина, вкладыш пальца
finite – ограниченный
fit – оснащать; устанавливать; монтировать
flange – фланец
fleet – парк (машин)
flight – скребок (скрепера)
floating – плавучий
foot – опора, лапа (шагающего экскаватора)
force – сила
fragmented – раздробленный
frame – рама
track ~ – гусеничная рама
frequency – частота
fuel – топливо

**G**

gain – получать; достигать
ganged – секционный
gasoline – бензин
gear – 1) передача; 2) шестерня
gearing – редуктор
grade – уровень грунта
grader – грейдер
grind – перемалывать
ground hold – сцепление с грунтом

ground speed – поступательная скорость
guard ledger – противорежущая пластина, вкладыш пальца
guide – управлять

**H**

hardened – из закаленной стали
hardness – прочность, твёрдость
hauling – транспортировка
heavy use – интенсивное использование
heavy-duty – предназначенный для работы в тяжёлом режиме (в тяжёлых условиях); сверхмощный
height – высота
hinge – шарнир
hoist coupler – опрокидной блок
hole – яма
hood – капот
hopper – 1) ковш (скрепера); 2) – трюм
house – поворотная платформа (экскаватора)
hull – корпус судна
hydrant – гидрант (водоразборный кран)
hydraulic fluid – рабочая жидкость
hydraulic quick-disconnect blocks – гидравлические быстроразъемные блоки

**I**

implement – орудие
improvement – улучшение; увеличение
increase – увеличивать
inertia – инерция
inexperienced – неопытный
inspection – осмотр, проверка
install – устанавливать; монтировать
~ drainage – укладывать дренаж
interstate highway – федеральная автострада
investigation – исследование
irrigation – орошение, полив
~ rate – норма полива
irrigator – мелиоратор

**J**

jet propulsion – реактивное движение
jib – стрела
job site – рабочая площадка

**L**

labour-intensive – трудоёмкий
launch – выпускать
lay – укладывать, прокладывать
~ cables – укладывать кабели
~ pipes – укладывать трубы
length – длина
lengthen – удлинять
level – уровень
leveling – планировка (поверхности)
lever – рычаг
life-size – в натуральную величину
limit – граница, предел || ограничивать
limitation – ограничение
loading – загрузка
long-range – дальнеструйный
lower – опускать

**M**

maintain – обслуживать; содержать в исправности
make a circuit of the field – объехать поле по кругу
manoeuvre – перемещать (ковш драглайна)
manually – вручную
material handling – загрузка-разгрузка материалов
measure – измерять
meatpacking plant – мясокомбинат
medium-range – среднеструйный
mighty – мощный; могучий
mobile type – работающие в движении, мобильные
mode – режим
modular design – модульная конструкция
monitor – отслеживать, контролировать
motor – двигатель, мотор
hydraulic ~ – гидромотор
infinitely variable displacement ~ – бесступенчато регулируемый двигатель
mount – монтировать, устанавливать; крепиться
mounted on tracks – на гусеничном ходу
mounted on rubber tires – на пневмоколесном ходу
mow – косить, обкашивать
mower – косилка
boom ~ – манипуляторная косилка

disk ~ – ротационная косилка дискового типа
drum [drʌm] ~ – ротационная косилка с аппаратом барабанного типа
finger-bar ~ – пальцевая косилка
reciprocating ~ – возвратно-поступательная косилка
rotary ~ – ротационная косилка
sickle ~ – ножевая косилка
water ~ – водная косилка
mowing blade – косильный нож
mowing boat – лодка-косилка
mud – 1) ил; грязь; 2) болотный грунт

**N**

natural recharge – естественное пополнение
navigable – судоходный
noise – шум
nozzle – дождевальная насадка, сопло
centrifugal ~ – центробежная насадка
deflector ~ – дефлекторная (от лат. *deflecto* – отклонять) насадка
spray ~ – распыливающий наконечник, разбрызгиватель

**O**

obstacle – препятствие
obstruction – препятствие
one-piece – цельный
on-site – на месте эксплуатации; на объекте
open-cut coal mine – угольный разрез
operability – эксплуатационные качества
operate – 1) работать; 2) приводить в движение; управлять; 3) эксплуатировать
operation – действие; работа; операция
dump ~ – выгрузка
swing ~ – поворот на выгрузку
operating unit – рабочий орган
optional – дополнительный, устанавливаемый по желанию заказчика
output – производительность
overlap – перекрывать(ся)
owner – владелец

**P**

patent-pending – ожидающий выдачи патента
payload – полезная нагрузка; грузоподъемность.
pedal – педаль

performance – производительность
piled – сваленный в кучу
pipe – пульпопровод; трубопровод
    suction ~ – всасывающий пульпопровод
pipeline – пульпопровод; трубопровод
    ~ distribution – разводка трубопроводов
pivot – вращать(ся), поворачивать(ся)
pivot point – центр вращения
plate – пластина
plot – участок
portable ['pɔ:təbl] – переносной
positional type – позиционного действия (передвигаемые с позиции на позицию, где орошение проводится во время стоянки)
power – мощность|| приводить в действие
    engine ~ – мощность двигателя
    ~ output – выходная мощность
power-to-weight ratio – отношение мощности к весу
pressure – давление
prevent – предотвращать
profitable – прибыльный, выгодный
profoundly – очень, сильно; серьёзно
property tax – налог на недвижимость
puddle – лужа
pull – тянуть
pump – насос || нагнетать, качать
    centrifugal ~ центробежный насос
    ~ out – выкачивать
pumping rate – скорость откачки
purpose-built – специальный, специального назначения
push-tractor – трактор-толкач

**Q**

quantity – количество
quarry – карьер, открытая разработка

**R**

raise – поднимать
range – ряд; спектр || колебаться в пределах
rear attachment – заднее навесное оборудование
rear-mounted unit – задненавесной агрегат
reciprocating – совершающий возвратно-поступательное движение
reclamation work – мелиоративные работы ı

recovery cycle – цикл извлечения
reinforced – усиленный, укрепленный
release – ослабить; отпустить
remote-control – с дистанционным управлением
removable – съёмный; сменный
replaceable – сменный
reposition – переставлять
represent – представлять (в виде чего-л.)
rescue – спасение
research – (научное) исследование
resemblance – сходство
retailer – магазин розничной торговли
retrofit – дооснащать, дооборудовать; модернизировать
return on investment – окупаемость инвестиций
reversible – реверсивный
rib – ребро
ripper [ʼrɪpə] – рыхлитель
    multi-shank ~ – многозубый рыхлитель
    single shank ~ – однозубый рыхлитель
roadside – обочина, придорожная полоса
robotic – роботизированный
rock – камень; горная порода; скальная порода
rope – канат
    drag ~ – тяговый канат
    hoist ~ – подъемный канат
    steel ~ – стальной канат
    wire ~ – проволочный канат
rotating platform – поворотная платформа (экскаватора)
routine maintenance – текущее техническое обслуживание
rover – вездеход
row crop – пропашная культура
rpm (revolutions per minute) – [число] оборотов в минуту, об/мин
rubber cover – резиновая крышка
rubble – щебень
runoff – сток

**S**

sales network – сеть продаж
sand – песок
saving – экономия
scoop – копать
scraper – скрепер

elevating ~ – скрепер с элеваторной загрузкой
pull-type ~ прицепной скрепер
twin engine auger ~ – двухмоторный скрепер со шнековой загрузкой
twin engine push-pull ~ – двухмоторный сдвоенный скрепер
scraping – 1) вычерпывание; 2) зачистка; соскабливание; 3) скреперные работы
seedbed preparation – подготовка пашни
self-offload – саморазгружаться
self-powered – самоходный
self-propelled – самоходный
~ caterpillar structure – самоходная гусеничная опора
settling pond – отстойник
set-up – установка; устройство
sewer – канализация
shaft – ствол (дождевального аппарата)
shape – форма
shovel – ковш экскаватора
front ~ – прямая лопата (тип ковша экскаватора)
power ~ – механическая лопата (мехлопата); одноковшовый экскаватор
shoving – 1) сдвигание; отталкивание; 2) устранение
shore – берег
short-range – короткоструйный
sickle – нож режущего аппарата
~ section – сегмент ножа (ножевой сегмент)
side cutter – боковая режущая кромка
side wings – боковые щеки (отвала)
simplify – упрощать
site – место
construction ~ – строительная площадка, стройплощадка
size – размер
skilful – умелый
slew – вращать(ся), поворачивать(ся)
sliding frame – скользящая рама
slurry mixture – гидросмесь, пульпа
smooth – плавный
soil – грунт, земля, почва
solids – твердые частицы
source – источник
spare – избавлять (от чего-л.)

speed – скорость
spiral duct – винтовой канал
spoil – вынутый грунт; отвал
~ pile – отвал, террикон
spray – дождь (искусственный)
~ intensity – интенсивность дождя
spreading – распределение
sprinkler – дождевальный аппарат
gun-style ~ – дальноструйный дождевальный аппарат
sprinkling – дождевание, орошение дождеванием
~ device – дождевальный аппарат
~ installation – дождевальная установка
~ machine – дождевальная машина
centre pivot ~ machine – круговая дождевальная машина
lateral move ~ machine – фронтальная дождевальная машина
linear move ~ machine – фронтальная дождевальная машина
side-roll ~ machine – фронтальная дождевальная машина
steep – крутой
stick – рукоять (ковша экскаватора)
strain – нагрузка
stream – поток
strength – прочность
stub wing – открылок
stumpbuster – измельчитель пней
sucking – всасывание
suction inlet – всасывающее отверстие
surface – поверхность
flat ~ – ровная горизонтальная поверхность
inclined ~ – наклонная поверхность
suspended – подвешенный
suspension – подвеска
sustain – поддерживать
swath – прокос
swathboard – полевая доска, отвальная доска
swing – качать(ся), раскачиваться; поворачиваться
~ operation – поворот на выгрузку
swivel – вращаться, поворачиваться

**T**

tackle – работать с

tailing pond – хвостовой пруд (для хранения радиоактивных, токсичных и других отвальных отходов обогащения полезных ископаемых, именуемых хвостами)
take turns – делать что-л. по очереди
tank – бак
    fuel ~ – топливный бак
    hydraulic oil ~ – маслобак гидросистемы
target values – целевые значения
tele-operated – с дистанционным управлением
terrain – территория; местность
three-point hitch – трёхточечное навесное устройство
throw – забрасывать (ковш)
tilt – опрокидываться
tip – наконечник
tool – рабочий орган; орудие
toothed wheel – (роторное) колесо с зубьями
torque divider – распределитель крутящего момента
tracked – гусеничный
trailer – прицеп
transfer – переносить
transmission shift point – точка переключения коробки передач
trench – канава; траншея
trencher – траншеекопатель, траншейный экскаватор; канавокопатель
    chain-type ~ – цепной траншеекопатель
    portable ~ портативный траншеекопатель
    wheel ~ – роторный траншеекопатель
trial – испытывать, подвергать испытанию
triangular blade – треугольная пластина
truss – ферма (стержневая система с узлами)
    two-arm sprinkling ~ – двухконсольная дождевальная ферма
tube – труба
    sectional distribution ~ – разборный распределительный трубопровод
tungsten-steel alloy – сталь, легированная вольфрамом
turret – башня

**U**

undercarriage – шасси, ходовое устройство
underdrain installation – закрытая дренажная установка
underwater weeds – сорная водная растительность
uneven – неровный

unlike – в отличие от
utilize – использовать

**V**

variable – регулируемый
V-belt – клиновой ремень
vehicle – транспортное средство
    unmanned aircraft ~ – беспилотный летательный аппарат
verification test – проверочные испытания
versatile – универсальный
vibration – вибрация
vibrotactile – вибротактильный
view – обзор; вид
visibility – видимость; обзор
volume – объем
volute – спиральная камера, улитка (центробежного насоса)

**W**

wage – заработная плата
water pipe – водопроводящая труба
watering – полив
    ~ range – дальность полива
waterway – водный путь; фарватер
wear and tear – износ
wear-resistant – износоустойчивый
weight – вес
well – колодец
wheel – 1) колесо; 2) руль; 3) фреза
    rock ~ – фрезерный траншеекопатель; скальная фреза
    toothed ~ роторное колесо с зубьями
    ~ slip – пробуксовка колёс
    ~-steering technology – технология управления колесами
width – ширина
winch – лебедка
    integrated stabilizing ~ – встроенная стабилизирующая лебедка
winding up – подтягивание (с помощью лебедки)
workload – объем работы

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