Министерство образования и науки Российской Федерации
Федеральное государственное бюджетное образовательное учреждение
высшего профессионального образования

**Санкт-Петербургский государственный технологический
университет растительных полимеров**

**В.В. КИРИЛЛОВА Н.В. ЛАЗАРЕВА
Т.В. ЛИОРЕНЦЕВИЧ Ю.В. ПАСИЧНИК**

АНГЛИЙСКИЙ ЯЗЫК

Учебно-методическое пособие
по переводу научно-технической литературы для студентов
химико-технологического факультета

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«Санкт-Петербургский государственный технологический университет растительных полимеров»

В. В. Кириллова, Н. В. Лазарева, Т. В. Лиоренцевич, Ю. В. Пасичник

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Пособие состоит из 24 уроков, оснащенных упражнениями, приложений и терминологического словаря. Приложения содержат коррективный фонетико-орфоэпический минимум, таблицы основных грамматических трудностей перевода технической литературы и дополнительные тексты для чтения.

Предназначено для студентов химико-технологического факультета и имеет цель - развить навыки чтения и перевода специальной научно-технической литературы.

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Введение

Предлагаемое учебно-методическое пособие предназначено для студентов химико-технологического факультета и имеет цель развить навыки чтения и перевода специальной научно-технической литературы. Тексты посвящены описанию технологических процессов приготовления бумаги и картона.

Пособие состоит из 24 уроков, приложений и словаря. Каждый урок включает два текста: для устного изучения и письменного перевода. Предшествующие текстам упражнения имеют целью снять фонетические, лексические и грамматические трудности и определить словарный минимум, который студенты должны заучить. Послетекстовые упражнения предназначены для активизации лексико-грамматических знаний студентов по определенной теме и повторения лексического минимума. Тексты для письменного перевода служат углублению навыков изучающего чтения по специальности.

Приложения содержат: 1) коррективный фонетико-орфоэпический курс на материале специальной лексики; 2) таблицы основных грамматических трудностей перевода технической литературы; 3) дополнительные тексты для домашнего чтения и переводов.

Словарь, прилагаемый в конце пособия, включает необходимые для перевода слова в их контекстуальном значении.

Все методические материалы Приложений используются по усмотрению преподавателя. В качестве дополнительного учебного материала рекомендуется пособие Кирилловой В. В. и Вихман Т. М. «Английский язык: учебно-методическое пособие по переводу научно-технической литературы для студентов и аспирантов технических специальностей»/ СПбГТУРП. СПб., 2004.

Урок 1

1. Вспомните основные правила чтения согласных букв в английском языке (см. Приложение I, п. 1). Прочитайте следующие слова и объясните их чтение.

thousand, invention, agriculture, century, establish, either, polished, substantially, packaging.

2. Выпишите из словаря следующие слова с транскрипцией и переводом. Запомните их произношение и значение.

paper (n.), paperboard (n.), recognize (v.), availability (n.), record (v., n.), beat (v.), bark (n., v.), screen (v.), fiber (n.), time (n.), refine (v.), spread (v.), remain (v.), source (v.), separate (v.), suspend (v.), dip (v.), sheet (n.), felt (n.), smooth (a.), development (n.), increase (v.), rate (n.).

3. Правильно прочитайте интернациональные слова и дайте их русский эквивалент. Выпишите с переводом подчеркнутые слова. Посмотрите их значение в словаре и запомните их.

product **['prɔdʌkt]**, civilization **[ˌsɪv(ə)laɪ'zeɪʃ(ə)n]**, manufacture **[ˌmænjə'fæktʃə, ˌmænju'fæktʃə]**, technique **[tek'ni:k]**, machine **[mə'ʃi:n]**, original **[ə'rɪdʒ(ə)n(ə)l]**, communication **[kə,mju:nɪ'keɪʃ(ə)n]**, photocopier **['fəutəukɔpɪə]**, efficient **[ɪ'fɪʃ(ə)nt, ə'fɪʃ(ə)nt]**.

4. От данных глаголов с помощью суффикса -tion (-ation, -ion) образуйте существительные со значением названия действия или его результата. Переведите их.

invent, apply, consider, combine, add, form, modify, compose, degradate, continue.

5. Переведите существительные, образованные с помощью суффикса -ing и означающие название действия и его результат.

papermaking, blending, printing, coating, pulping, bleaching, cutting, mixing.

6. Прочитайте и переведите словосочетания.

mulberry bark, art form, communication medium, consumption figures, dryer section.

7. Переведите предложения, обращая внимание на значение слова to mean - означать, the means - средства.

1) The most common means for controlling the air in the dryer section is with dryer hood.
2) This formation means that the fibers are poorly distributed and the sheet is cloudy.
3) The major means for heat transfer must be conduction from the hot dryer surface to the paper web.
4) This fact means that the lignin molecule is hard to characterize and

cannot be represented by one chemical formula.
5) External fibrillation is the most important means of obtaining bonding in the sheet.
6) The web is pressed against the coater by means of backing roll.

8. Переведите предложения, обращая внимание на разные функции и перевод глагола to be (см. Приложение II, табл. 1).

1) Calcium carbonate is one of the pigments used for the coating.
2) A higher level of gloss is obtained by a process known as chrome coating.
3) If soluble adhesives are to be used, there must be equipment for their preparation.
4) There are still cultures in the South Pacific where papers are made by beating bark with stones.
5) The first step in the manufacture of chemical pulps is the chipping operation.
6) The most basic property of the sheet of paper is its basic weight.

9. Переведите предложения, обращая внимание на пассивный залог (см. Приложение II, табл. 3).

1) Straw, sugar cane and other grasses have been and are being used in certain papers.
2) This quality reduction can be counteracted by increasing the initial caustic concentration in the cooking liquor.
3) The chips will be partially crushed in the water extraction and completely broken into fibers in the refiner.
4) Some waterpapers are given chemical treatment that makes it too difficult to break down.
5) The Mullen test (тест на разрыв) is influenced primarily by bonding.
6) These test methods are generally referred to as end use simulation tests.
7) Unbleached grounded and sulfite pulps are being used in newsprint.
8) If the large particles of the fibers are given enough opportunity to pass through the slots, they will pass.
9) The strength of paper is positively affected by increased refining.
10) The performance of paper in different converting operations is influenced by the moisture content of the paper.

10.Прочитайте и переведите текст.

History and development of the pulp and paper industry

Thousands of different types of paper and paperboard are made today. These products are so common that we use many of them without recognizing their source. Versatility (универсальность), availability make paper so important to our civilization and to our standard of living.

The first historically recorded invention of papermaking is given to Tsai Lun. This Chinese Minister of Agriculture beat silk and mulberry

bark together and screened the fibers from water with a bamboo mold. This invention in 105 A.D. is now recorded as the first time when the present method of manufacture was used. The basic technique was refined by the Chinese and kept as a well-guarded secret until the eighth century, when it was brought by a prisoner of war and used in Samarkand.

The art of papermaking then spread through Central Asia, Asia Minor and Egypt and into Europe, where it was quite well established by 1400. During this period the basic technique remained relatively unchanged. Fibers from many different sources were separated and suspended in a vat of water, and a mold or screen of some sort was dipped into the vat and lifted out of water. After the sheet of paper was formed, it was pressed between felts and either hung or placed on a smooth surface to dry. This technique is still practiced in many parts of the world, primarily as an art form.

With the growing demand for paper many developments began to increase the production rate of papermaking, but the most important was the invention of papermaking machines around 1800. From that time to the present the same techniques have been refined, polished and made more efficient, but not substantially changed from Tsai Lun's original concept.

The development of the industry is closely parallel to the development of Western civilization. Paper has become an integral part of the development of our culture both as a communication medium and in packaging. The per capita consumption figures show the relationship between paper use and industrial development in other cultures.

In North America per capita consumption (lb/year) of paper is 582. In France – 256 lb/yr, in United Kingdom – 269 lb/yr, in India – 4 lb/yr, in Mexico – 88 lb/yr, in Africa – 13 lb/yr.

11.Ответьте на вопросы.

1) When was the first invention of papermaking historically recorded?
2) How did Tsai Lun manufacture the first paper?
3) How did the art of papermaking spread?
4) What was the technique of papermaking in the Middle Ages?
5) What was the most important invention in the development of papermaking industry?
6) How is the consumption of paper related to the development of civilizations?

12.Заполните пропуски нужным предлогом и переведите предложения.

to- дательный падеж, к; by – творительный падеж (кем? чем?), с помощью; in, into – в; with – с; between – между.

1) Availability makes paper very important ... to our civilization.
2) A screen was dipped ... the vat.
3) The technique of papermaking was developed ... the Chinese.
4) ... the growing demand for paper the production rate of papermaking was increased.
5) The sheet of paper is pressed ... the felts.

13.Заполните пропуски нужной глагольной формой.

beet, is, is practiced, screened, was placed, has become, was formed.

1) The development of papermaking ... parallel to the development of culture.
2) This technique ... in many parts of the world.
3) Paper ... an integral part of the development of our civilization.
4) Tsai Lun ... silk and mulberry bark and ... the fibers from water.
5) The sheet ... and ... on a smooth surface to dry.

14.Переведите текст – письменно со словарем.

Pulp and paper products are very different. Each product requires certain unique properties which must be derived from the raw material. For instance, newspaper must be inexpensive, strong enough to withstand the tension imposed by the printing press without breaking and have good printing properties. It is often made from recycled paper with added mechanical or chemical softwood pulp for strength. Photocopier paper must have excellent brightness, a superb printing surface and must not curl in the photocopier. Highly bleached chemical pulp is used. This type of paper is made by blending hardwood pulp (for a very smooth printing surface) with softwood pulp (for strength). Additives such as clay and titanium dioxide are added to enhance the printing surface.

Урок 2

1. **Вспомните основные правила чтения гласных букв в английском языке (см. Приложение I, п. 2). Прочитайте следующие слова и объясните их чтение.**

primarily, other, certain, document, property, major, hardwood, frequently, due, desired, final, virgin, bulk, permanence, pulp, sulfite, imported, include, since, variation, fall.

2. **Выпишите из словаря следующие слова с транскрипцией и переводом. Запомните их произношение и значение.**

raw material (n.), obtain (v.), wastepaper (n.), virgin fiber (n.), secondary fiber (n.), strength (n.), permanence (n.), blend (v., n.), rags (n.pl.), straw (n.), cane (n.), property (n.), hardwood (n.), softwood (n.), contribute (v.), grade (n.), coarse (a.), achieve (v.), choice (n.), purity (n.), clean (v.), bleach (v.), quality (n.), savings (n.pl.), application (n.), boxboard (n.), bulk (n.), fill (v.).

3. **Правильно прочитайте интернациональные слова и дайте их русский эквивалент. Выпишите с переводом подчеркнутые слова. Посмотрите их значение в словаре и запомните их.**

selection **[sɪ'lekʃ(ə)n]**, document **['dɔkjəmənt, 'dɔkjumənt]**, category **['kætəg(ə)rɪ]**, balance **['bæləns]**, disperse **[dɪ'spə:s]**, viscosity **[vɪs'kɔsɪtɪ]**, adhesive **[əd'hi:sɪv]**, management **['mænɪdʒmənt]**.

4. От данных глаголов с помощью суффикса -ment образуйте существительные со значением названия действия и его результата. Переведите их.

develop, treat, improve, measure, equip, manage.

5. Переведите следующие существительные, образованные с помощью суффикса -ance (-ence) и означающие название действия и его результата.

difference, permanence, resistance, reflectance, dependence, maintenance.

6. Прочитайте и переведите словосочетания.

raw material selection, coating application system, viscosity behaviour, stress-strein relationship, highest product quality.

7. Переведите предложения, обращая внимание на предлог due to - благодаря.

1) Due to the presence of lignin these papers do not have any permanence and yellow easily.
2) The liquor penetrates the chips by capillary action, but also due to the pressure that exists in the digester.
3) Species which are not useful in one region are acceptable in another due to differences in climatic conditions.
4) The pressure that develops in the digester becomes greater than that which is associated with the temperature due only to steam pressure.
5) The use of this standard unit (g/m) has not spread too rapidly in the USA due to the persistence of older methods of using metric size.

8. Переведите предложения, учитывая значение слова the order - приказ, порядок; in order to - чтобы.

1) The order was given to produce the highest product quality.
2) The aim of refining is to break down the order within the fiber wall to reduce the stiffness of the fiber.
3) Several cellulose molecules pass through region of high and low order in the threads of the cellulose chains.
4) In order to be used in the mill the wood must be harvested and transported from the forest to the mill.
5) The wire returns to the breast roll in order to receive more stock and continue formation of the continuous web.

9. Переведите предложения, учитывая функцию и значение глагола to have (см. Приложение II, табл. 2).

1) Cellulose fibers have the property to bond on other fibers.
2) Paper has become an integral part of the development of our culture.
3) A single sheet pulled from the pile will have a smoother surface.
4) Each mill has to develop its own equipment based on the grades to be produced and the types of raw material to be processed.
5) The amount of coating on the surface has to be metered to ensure that it is of the desired thickness.

10. Переведите предложения, обращая внимание на пассивный залог глаголов (см. Приложение II, табл. 3).

1) Sulphite pulping operations have additional tanks which are used to accumulate sulfur dioxide gas.
2) These digesters are operated with one chips supply and one liquor supply system.
3) The rolls are driven by the wire passing over them.
4) The basis weight of the web is affected by the size of the slice opening.
5) The properties of the paper are greatly influenced by refining.
6) The strength of the paper is positively affected by increased refining.

11. Прочитайте и переведите текст.

Raw material selection

The possibilities of choice for raw material are primarily wood fibers obtained directly from trees (virgin fibers) or those obtained from wastepaper (secondary fibers). Other fibers have been used and still are to a certain extent today. Cotton fibers give paper strength and permanence and therefore are used for money paper and paper for documents. But cotton is very expensive. And the blending of synthetic fibers with cotton in clothing renders these rags practically useless to the papermakers. Straw, sugar cane and other grasses are being used in certain applications because they are sometimes more available or have special properties needed in the final product.

We group wood fibers into two major categories: the hardwoods and the softwoods. Hardwoods are the broad-leaved trees, such as maple, oak, birch etc. Softwoods are the evergreens or needle-bearing trees, such as pine, spruce, fir etc. Softwoods generally have longer fibers, which will contribute to greater strength in the paper. The hardwood gives us fibers that help to fill in the sheet of paper making the sheet smoother, more opaque and usually better for printing. Softwoods are frequently the only fiber used in grades where strength is needed and the coarseness can be tolerated. Hardwoods, on the other hand, are seldom used alone due to low strength of the paper produced. Most paper and paperboard is made from a blend of both types balanced to achieve the desired final properties.

The choice between virgin fibers and secondary fibers is made on two major points: strength and purity. Secondary fibers are generally lower in strength. They can be cleaned and bleached to produce high-quality papers, but the cost of these added operations negates to savings. The major application of secondary fibers is in products where cleaning is not needed. Combination boxboard that has a grey layer in the centre is the largest use of secondary fibers. In this application the secondary fibers give bulk and strength in the paperboard, but can be covered with white pulp to give the desired printing characteristics.

12. Ответьте на вопросы.

1) What kind of fibers can be used for papermaking?
2) What are the main characteristic features of softwoods?
3) What are the main characteristic features of hardwoods?
4) What is the difference between virgin fibers and secondary fibers?
5) Where are the secondary fibers applied?

13. Замените пропуски нужным глаголом. Поставьте его в пассивной форме.

(affect, need, make, obtain, use, tolerate).

1) The virgin fibers ... directly from wood.
2) Special properties ... in the final product.
3) The softwoods ... in grades where strength is necessary.
4) Most paper and paperboard ... from a blend of different kinds of wood.
5) In this grade of paper the coarseness of the fibers ...
6) The quality of the paper ... by the operations of cleaning and bleaching.

14. Заполните пропуски нужным по смыслу предлогом: for, with, to, between, from, of, into.

1) The secondary fibers are obtained ... wastepapers.
2) Cotton fibers are used ... money paper and paper ... documents.
3) The blending ... synthetic fibers ... cotton in clothings renders these rags useless to the papermaker.
4) We group wood fibers ... two major categories: the hardwood and the softwood.
5) Long fibers contribute ... greater strength in the paper.
6) The choice ... virgin fibers and secondary fibers is made on two points: strength and purity.

15. Переведите текст письменно со словарем.

Rheology is the study of stress-strain relationships for rigid materials or is the study of the viscosity behavior of liquids under different shear (разрезание) conditions. The rheology of the coating is important and must be controlled so that the coating can be pumped easily or flow under gravity and later be able to perform well under different conditions of the coating application system.

Any pigment to be used in coating must be able to disperse in water; it is also desirable that it have a low viscosity when dispersed and allow the solids of the coating to be raised as high as possible. Many of the pigments are supplied in a 70% solids by weight slurry (масса суспензии) eliminating the need for the coater to disperse the pigments. However, these slurries also limit the maximum solids to which the coating can be raised.

Урок 3

1. Вспомните основные правила чтения буквосочетания двух гласных в английском языке (см. Приложение I, п. 3). Прочитайте следующие слова и объясните их чтение.

sheet, cleaning, softwood, found, employ, glue, treat, layer, exceed, earth, header, coated, flood, amount, double, source.

2. Выпишите из словаря следующие слова с транскрипцией и переводом. Запомните их произношение и значение.

select (v.), pulp (n.), pulping (n.), groundwood (n.), common (a.), grade (n.), improve (v.), sole (a.), reason (n.), preference (n.), waste (n.), consideration (n.), resistance (n.), whiteness (n.), package (v.), opacity (n.), printability (n.), tissue (n.), blend (v.).

3. Правильно прочитайте интернациональные слова и дайте их русский эквивалент. Выпищите с переводом подчеркнутые слова. Посмотрите их значение в словаре и запомните их.

the process **['prəuses]**, to process **['prəu,ses]**, sulphite **['sʌlfaɪt]**, carton **['ka:t(ə)n]**, actually **['æktʃuəlɪ]**, the industry **['ɪndəstrɪ]**, industrial **[ɪn'dʌstrɪəl]**, control **[kən'trəul]**, hydroxyl **[haɪ'drɔksɪl]**, adequate **['ædɪkwɪt]**.

4. Переведите существительные, образованные с помощью суффиксов -ty (-ity), -ness и означающие название качества.

versatility, property, possibility, purity, viscosity, gravity, opacity, printability, uniformity, density.
whiteness, smoothness, brightness, thickness, newness, blueness.

5. От данных прилагательных образуйте наречия с помощью суффикса -ly. Переведите их.

usual, frequent, ready, large, essential, primary, considerable, partial, original, sufficient.

6. Прочитайте и переведите словосочетания.

publication grades, printing grades, writing grades, packaging application, fiber sources, Kraft pulping operation, bleached softwood kraft, different pulp types, annual growth rings.

7. Переведите предложения, обращая внимание на значение глагола to follow - следовать (за).

1) The web of paper is trimmed to the width needed by the process that will follow.
2) Following the cooking and screening operations it is necessary to remove the waste liquor from the stock.
3) The pulp is normally subjected to washing immediately following bleaching to remove the spent bleach liquor and the impurities.
4) The difference in growth following cell division gives the tree its characteristic annual growth rings.

5) The chips are delivered to the chip bin from the chip storage area following the necessary screening operations.

8. Переведите предложения, обращая внимание на наречие once - 1) некогда; 2) однажды, один раз; 3) заменяет союзы if, when, усиливая их значение.

1) With continuous refiners the stock is pumped through once.
2) It was assumed that the water could reach the surface easily and had only be evaporated once.
3) Once ready for use pigment dispersions must be metered, blended, screened, stored and pumped to the application system.
4) Once the raw material has been selected we need to liberate the fibers.
5) Once the chips are dumped inside the digester they build up (скапливаться) on top of other chips already present in the digester forming a large pile.
6) Once the fibers have been separated they are formed into a mat.

9. Переведите предложения, обращая внимание на пассивный залог глаголов (см. Приложение II, табл. 3).

1) A typical pulp and paper mill is operated some 355 days per year, 24 hours per day, by a stuff of a few hundreds people.
2) The decision is influenced by the drying capacity of the machine.
3) Unbleached groundwood and sulphite have been and are being used in newsprint.
4) The composition of the coating is affected by the grades being produced and the method of application.
5) The visitors were shown the world's most advanced production line.
6) Some papers are given either chemical treatment or coatings.
7) The steam is blown into the chip stream while the chips are being loaded into the digester.

10. Прочитайте и переведите текст.

Liberation of fiber from wood (1)

Once the raw material has been selected we need to liberate the fibers, to disintegrate the wood into its fibers.

Mechanical method is for yellow paper of low strength similar to groundwood, which is the most common mechanical pulp. These processes are used primarily on softwoods to produce printing or writing grades such as newsprint and other publication grades. So mechanical pulps are not the sole pulps used and are blended with stronger, whiter grades to improve the quality and permanence of paper produced.

Chemical methods for liberation of fibers from the wood use either softwoods or hardwoods, or a blend of the two. The Kraft pulping process, a chemical pulping operation, will generally produce a stronger paper and is more common than the sulfite process. Strength differences are not the only reason for the preference for kraft pulping. Waste product from kraft pulping operations can be reused more readily and other ecological considerations also favour the kraft process over

sulphite.

Unbleached softwood kraft is found in packaging applications, such as sacks, bags and some folding cartons, where maximum strength and water resistance are needed. Bleached softwood kraft is used in almost all grades of paper because of its whiteness and strength. It is used alone in some packaging grades but is generally blended with bleached hardwood kraft for improved smoothness, opacity and printability.

Sulphite pulps are generally whiter than kraft in the unbleached form and therefore have been used up to about 20% in the unbleached form to add strength to newsprint. Bleached sulphite has been used in tissue because the fibers can make a softer paper than kraft and in printing papers because the fibers are purer and therefore give greater permanence to the paper. Most grades of paper and paperboard are made from a blend of different pulp types to give the final product the optimum combination of properties.

11. Ответьте на вопросы.

1) What grades of wood are treated by mechanical method of pulping?
2) What grades of paper are produced from the fibers treated by mechanical method?
3) What grades of wood may be treated by chemical method of pulping?
4) What are the advantages of the kraft process of pulping?
5) Where are unbleached and bleached softwood kraft pulps used?
6) What are the advantages of the sulphite process of pulping?
7) How can the final product with optimum combination of properties be produced?

12. Заполните пропуски нужным глаголом. Поставьте его в пассивной форме.

(reuse, blend, improve, make, need)

1) The mechanical pulps ... by blending with other grades of pulp.
2) Waste products from the kraft pulping operations ... with great success.
3) Maximum strength and water resistance ... in some folding cartons.
4) Bleached softwood kraft pulp ... with bleached hardwood kraft pulp.
5) Most grades of paper ... from a blend of different pulp types.

13. Найдите глаголы, от которых образованы следующие существительные.

disintegration, printing, publication, liberation, operation, difference, consideration, application, resistance, combination.

14. Переведите текст письменно со словарем.

Fiber resources and fiber properties

A papermaking fiber must be able to bond to other fibers without the addition of glue or adhesive to the structure. Cellulose fibers have this property and therefore are the prime raw material for papermaking.

Cellulose fibers are found in most living plants. These fibers can be separated and dispersed in water, and can therefore be deposited from the water suspension in a random network. The polarity of water and

the presence of hydroxyl groups in the fibers make them bond to one another through the hydrogen bond. By selection of the paper source for our cellulose fibers we can obtain the strength or smoothness of surface needed of different papers. Of course, one prime consideration must be the ready availability of the desired raw material. Many plants can supply fibers that can be used to make paper. However, at present time wood is the predominant source of fibers.

Урок 4

1. Вспомните основные правила ударения в английском языке (см. Приложение I, п. 4). Прочитайте следующие слова и объясните ударение в них.

fibrillation, difference, to promote, manufacturing, surface, property, caliper, balance.

2. Выпишите из словаря следующие слова с транскрипцией и переводом. Запомните их произношение и значение.

yield (n.), treatment (n.), advantage (n.), stiffness (n.), suited (a.), corrugated (a.), indicate (v.), full (a.), dissolve (v.), glue (n.), remote (v.), leave (v.), initial (a.), depend (v.), extent (n.), associate (v.), reduce (v.), bleaching (n.), purification (n.), extensively (adv.).

3. Правильно прочитайте интернациональные слова. Выпишите с переводом подчеркнутые слова. Посмотрите их значение в словаре и запомните их.

chemicals **['kemɪk(ə)lz]**, cellulose **['seljəlәus]**, to design **[dɪ'zaɪn]**, enzyme **['enzaɪm]**, alkaline **['ælkəlaɪn]**, degradation **[ˌdegrə'deɪʃ(ə)n]**, complexity **[kəm'pleksətɪ]**, base **[beɪs]**.

4. Переведите слова, учитывая отрицательные значения префиксов un-, in-, im-, de-, dis- .

unchanged, unbleached, disadvantage, to defiber, improper, untreated, to dissolve.

5. Переведите существительные с суффиксом -th, означающим название качества.

strength, width, length.

6. Переведите словосочетания.

board manufacture, combination process, high yield process, full chemical pulping operation, final fiber wall thickness.

7. Переведите предложения, учитывая значение слов: some (как прилаг.) - некоторый; (как наречие) - несколько; same (как прилаг.) - тот же самый.

1) These pulps can be employed in some applications where unbleached kraft is used.
2) If the pure structure of the web is not the same on both sides, it leads to curling.

3) Some secondary fibers are cleaned and used in tissue papers.
4) The paper machine and its operation build some characteristics into the sheet of paper.
5) Some plants are used primarily to produce pulps.
6) All paper and paperboard manufacturing processes are based on the same techniques and operations.

8. Переведите причастные формы от следующих глаголов.

indicate - indicating - indicated - having indicated
dissolve - dissolving - dissolved - having dissolved
leave - leaving - left - having left
depend - depending - depended
associate - associating - associated
reduce - reducing - reduced - having reduced
design - designing - designed.

9. Переведите предложения, учитывая перевод причастий (см. Приложение II, табл. 5).

1) Papers made from different types of trees produce different forms of fibers.
2) The art of papermaking was quite well established in Europe by 1400.
3) The wood, when cooked, released acids into the cooking solution.
4) The chemical reactions remove some of the cellulose leaving us with lower yield from pulping.
5) The aim of pulping is simply to liberate the fibers from the raw material being used by the process.
6) The sheet coming from the press section is at room temperature.

10.Прочитайте и переведите текст.

Liberation of fibers from wood (2)

Between mechanical and chemical processes of liberation of fibers from wood are the high-yield processes which use some chemical treatment and some mechanical treatment to liberate the fibers. As such, they have some of the advantages and disadvantages of each process - producing pulp that is not as strong as kraft or as bright as groundwood. High-yield pulps give a degree of stiffness and strength to paper that make them ideally suited for use in corrugated container-board manufacture. They can also be employed in some of the other applications where unbleached kraft has been indicated. The name "high yield" indicates another difference between the pulping operations. Full chemical pulping operations dissolve the natural glue (lignin) in the tree to liberate the fibers. The chemical reactions also remove some of the cellulose, leaving us with a lower yield from the pulping operation. Full chemical pulps may have a final yield of only 50% of the initial weight of the wood, whereas the mechanical pulps can yield more than 90%. Yields from the combination processes fall somewhere in between, depending on the extent of chemical treatment.

Another operation generally associated with pulping that reduces the yield of pulping operations is bleaching. Bleaching can also be a

purification operation since the chemicals used are designed to react with and remove colored materials from the fibers. The colored materials are from the natural glues (lignin) in the wood. Bleaching has little effect on the strength of the resultant paper, unless the pulp is bleached extensively or to very high brightness which can reduce strength a little. The major reason for bleaching is its effect on the whiteness or brightness of the paper.

11. Ответьте на вопросы.

1) What kind of treatment does the high-yield process use?
2) What pulp does the high-yield process produce?
3) Where are high-yield pulps used?
4) What is the final yield of full chemical pulps, mechanical pulps and high-yield pulps?
5) What other operation reduces the yield of pulping?
6) What is the bleaching used for?

12. Замените пропуски нужным глаголом. Поставьте его в пассивной форме.

1) The colored materials ... from the fibers.
2) The bleaching ... with pulping.
3) Lignin ... by chemical pulping operations.
4) Cellulose ... by chemical reactions.
5) Unbleached kraft pulp ... for this application.

(indicate, remove (2), associate, dissolve).

13. Переведите письменно со словарем.

Wood is composed of cellulosic cells. Trees grow and develop through the division of special cells under the bark known as cambial cells that produce both the bark and woody tissue. Immediately after the cells are formed they are filled with a living material that deposits more cellulose on the inside walls of the cell developing the final fiber wall thickness. When the cell has grown to its full size, the living material dies leaving a hollow cell or fiber. The fiber is essentially a hollow tube connected to other fibers. These fibers are used by the tree to conduct fluids up to the leaves, where photosynthesis takes place, and to carry back sugars to the growing regions of the tree.

Besides conducting liquids the fibers must also support the tree and store liquids to maintain life during dry periods. All of these demands cause the tree to produce different forms of fibers. So the two major categories of trees, hardwood and softwood, contain different types of fiber or cells.

Урок 5

1. Выпишите из словаря следующие слова с транскрипцией и переводом. Запомните их произношение и значение.

stock (n.), preparation (n.), include (v.), modification (n.), perform (v.), cutting (n.), uniformity (n.), bonding (n.), ratio (n.), ensure (v.), mixing (n.), device (n.), layer (n.), thin (a.), flexible (a.), fourdrinier (n.), web (n.), wire (n.), thickness (n.), roller (n.), subject (v.), subject (n.), dense (a.).

2. Правильно прочитайте интернациональные слова. Выпишите с переводом подчеркнутые слова. Посмотрите в словаре их значение и запомните их.

fibrillation **[ˌfaɪbrɪ'leɪʃ(ə)n]**, formation **[fɔ:'meɪʃ(ə)n]**, consolidation **[kən,sɔlɪ'deɪʃ(ə)n]**, hydrogen **['haɪdrədʒən]**, ingredient **[ɪn'gri:dɪənt]**.

3. Переведите глаголы, обращая внимание на их суффиксы.

facilitate, oxidize, minimize, notify, recognize, integrate.

4. Переведите словосочетания.

lightweight paper, stock preparation, fiber modification, single layer paper grade, fiber damage.

5. Переведите предложения, учитывая значение слова result (n.) - результат, result (v.) - образоваться в результате, result in - привести к, result from - быть результатом (чего-то).

1) The size of the sample of paper affects the result and must be carefully controlled.
2) It is necessary to look at each operation to see what effect it may have on the properties of the resultant paper.
3) The removal of the lignin from the fibers results in the improvement of the stock.
4) A good permanence of the pulp results from chlorine dioxide used at a final bleach stage.
5) In the pulping process there is great fiber damage with resulting loss in strength.
6) Chemical pulping results in high strength of the fibers.

6. Переведите причастные формы следующих глаголов.

include – including – included – having included
perform – performing – performed
ensure – ensuring – ensured – having ensured
subject – subjecting – subjected.

7. Переведите предложения, учитывая перевод причастий (см. Приложение II, табл. 5).

1) Paper is rough on the surface being made of a random pile (скопление) of fibers.
2) The measurement is made using a focused beam of light directed toward the paper surface at an angle of 15º.
3) There are differences in the fibers found in different types of trees, but the differences are small compared with those in the properties of the products produced.
4) The hardwoods having a greater percentage of smaller fibers fill the sheet producing a smoother surface of the sheet.
5) If treated by another process, this type of wastepaper could be used.
6) The chips are not removed with the liquor but remain in the digesters settling slowly toward the bottom.

8. Прочитайте и переведите текст.

Stock preparation and paper making

The next stage of papermaking operations after pulping is stock preparation. It includes fiber modification or refining and is performed on most grades of paper. It is not needed to a great extent on groundwood or secondary fibers. There are basically two results to be obtained from refining: either cutting or fibrillation. Cutting will shorten the fibers, reduce the strength of the paper and at the same time improve the uniformity, or what is known as the formation. Cutting has less effect on strength of the paper than fibrillation. Fibrillation is a physical modification of the fibers which facilitates bonding between fibers and develops the strength in the paper.

Since most papers are made from blends of fibers, chemicals and pigments, we need to have operations that control the ratio and ensure the proper mixing of the ingredients.

During the process of papermaking itself, different forming devices give the products their major physical difference. Single-layer paper grades are primarily any lightweight, thin or flexible paper or paperboard. The oldest and most common machine for making lightweight paper is the fourdrinier. Heavier grades of paper and paperboard are usually produced by combining several layers of fibers or web of paper.

The operation of consolidation of the web is again used on all grades of paper and paperboard. The web is deposited on a forming wire or screening device at a thickness greater than the final thickness of the product being produced. The web is pressed between rollers to reduce the thickness, bring the fibers closer together to promote bonding and remove water.

All grades of paper will be subjected to varying amounts of pressing. Bulky products like tissue will receive the least pressing. The most dense paper or paperboard, such as construction boards, will be pressed the most.

9. Ответьте на вопросы.

1) What does the process of stock preparation include?
2) What is the aim of refining?
3) What is the effect of cutting?
4) What is the effect of fibrillation?
5) Why is the proper mixing of the ingredients of the paper necessary?
6) What papers are produced with single layer grades?
7) How are heavier grades of paper produced?
8) What papers are subjected to pressing?
9) What is the aim of consolidation of the web?

10. Замените пропуски нужной причастной формой глаголов.

1) A physical modification of the fibers ... the strength of the paper is called fibrillation.
2) Different ... devices give the products their major physical differences.

3) The consolidation is ... to obtain greater final thickness of the product.
4) All grades of paper are subjected to ... amounts of pressing.
(to vary, to use, to develop, to form).

11. Найдите в тексте примеры прилагательных и наречий в форме различных степеней сравнения.

12. Переведите текст письменно со словарем.

In addition to the difference in the physical shape of the fibers found in hardwood and softwood there is also chemical difference between the two. Photosynthesis in trees produces primarily glucose which is converted into cellulose, but may also produce other sugars that are not included in the cellulose structure found in the fiber wall. These other sugars are called hemicelluloses and are found in different degrees in the two types of trees. The other component, lignin, is the phenolic glue or cementing substances created by the tree to hold the fiber together. These differences in chemical composition are less important in influencing paper properties than are the physical characteristics.

Урок 6

1. Выпишите из словаря следующие слова с транскрипцией и переводом. Запомните их произношение и значение.

stack (n.), calliper (n.), occur (v.), sizing (n.), surface (n.), apply (v.), starch (n.), solution (n.), pass (v.), intend (v.), disrupt (v.), ink (n.), split (v.), coat (v.), converting (n.), creeping (n.), embossing (n.), require (v.), rewinding (n.), sheeting (n.).

2. Правильно прочитайте интернациональные слова.

calendar **['kæləndə, 'kælɪndə]**, agent **['eɪdʒ(ə)nt]**, cement **[sɪ'ment]**, substance **['sʌbst(ə)ns]**, pigment **['pɪgmənt]**, calcium carbonate **['kælsɪəm] ['ka:b(ə)neɪt]**, emulsion **[ɪ'mʌlʃ(ə)n]**.

3. С помощью суффикса -er (-or) от данных глаголов образуйте существительные со значением действующего лица. Переведите их.

fill, digest, coat, wash, clean, feed, grind, chip, extract.

4. Переведите прилагательные, учитывая значение суффиксов -ful (положительное качество) и -less (отрицательное качество).

useful, useless, powerful, powerless, colourless, successful, helpful, harmful.

5. Прочитайте и переведите словосочетания.

web modification, water resistance, mechanical surface treatment, coating operation.

6. Переведите предложения, учитывая значение слова since 1) (adv.) – с тех пор; 2) (prep.) – с, после; 3) (cj) – так как.

1) Since paper is made in water and since it is made of cellulose

which is hydroscopic, paper will take on water from the atmosphere or lose it to atmosphere.
2) Since those figures were published, many mills have eliminated their effluent.
3) Since 1800th, when the first papermaking machine was invented, the paper industry began to develop rapidly.
4) All paper and paperboard must be dried since water is used to form almost all papers and must be removed.

7. Переведите причастные формы следующих глаголов.

occur – occurring
apply – applying – applied
intend – intended
disrupt – disrupting
coat – coating – coated
require – requiring – required – having required.

8. Переведите предложения, учитывая особенности перевода независимого причастного оборота (см. Приложение II, табл.6).

1) The rosin (канифоль) having been mixed with the fibers, alum is added to the stock.
2) The chips are fed between two discs, one of them stationary and the other rotating at a high rate of speed.
3) The temperature being raised to the desired level, the cooking zone became centre of the digester.
4) The kraft process is basically an alkaline cook, with sodium hydroxide being the primary cooking chemical.
5) Opacity is expressed as a percentage, with the highest opacity being 100%.

9. Прочитайте и переведите текст.

Web modification

Web modification operations are used at every stage of papermaking. The papermaking operations could proceed quite well without these modifications, but the quality or usefulness of the paper or paperboard would suffer.

The most common modification operation is the use of the calender stack at the end of the paper machine. The calender stack is simply a stack of steel rolls through which the paper is passed. The rolls smooth the surface of the web and may reduce the calliper or thickness.

The second most common treatment, but one that physically occurs before calendering, is surface sizing. The surface size is usually applied in the paper machine after the web has been formed, pressed and nearly dried. The sizing materials are usually starch solutions which are applied as the web passed between two rollers. The sizing agent is intended to smooth the surface, it also increases the resistance of the surface to water and to being disrupted by the forces created in the printing press when the ink is split between the paper and the

application surface. Obviously, this treatment is most important for printing and writing grades. Packaging grades may use this treatment, but will need more resistance than can be obtained with a size press. So they will be coated with other materials during converting operations. Tissue paper, which do not need water resistance, will receive mechanical surface treatment in the form of creeping on the paper machine or embossing to make the surface softer to the touch.

Since paper or paperboard is produced on a machine that is normally 20 or more ft wide and the user of the product requires smaller rolls or even sheets of the product, there is a need to modify the physical shape of the web by rewinding or sheeting.

10. Ответьте на вопросы.

1) Where are the web modification operations used?
2) What is the role of calendar stack?
3) What is the aim of surface sizing?
4) What materials are applied for sizing?
5) What papers require the surface sizing?
6) When do the packaging grades of paper receive the surface sizing treatment?
7) How is the physical shape of the final web modified?

11. Переведите предложения, учитывая разные функции причастия II (Past Participle).

1) The thickness of the web was reduced by the rolls.
2) The thickness of the web reduced by the rolls was nevertheless great enough.
3) The sizing materials usually applied are starch solutions.
4) The sizing materials are applied as the web is passed between two rollers.
5) The sizing agent is intended to smooth the surface of the web.
6) The sizing agent intended to smooth the surface increases also the resistance of the surface of water.
7) The forces created in the printing press disrupt the surface of the web.
8) The resistance of the web is obtained with a size press.

12. Переведите существительные. Объясните их значение, исходя из значения словообразующего суффикса.

usefulness, modification, treatment, user, resistance, papermaking, quality.

13. Переведите текст письменно со словарем.

Pigmented coating is just a form of surface treatment but more complex than other methods of surface modification. A pigment is applied to the surface of the web. The pigment is applied in water with an adhesive present to hold the pigment on the surface of the web when it is dry. The pigments used are primarily the same three used as filler: clay, calcium, carbonate and titanium dioxide. Since the pigments materials are substantially smaller than the fibers, the coating operation creates a surface that is smoother than uncoated surface and that has a much finer pure structure. These two factors improve the printing

characteristics of the web. The coating may also improve the brightness of the web if the pigments are brighter than the fibers. The final benefit to be obtained from pigmenting coating is a possible improvement in gloss.

Урок 7

1. Выпишите из словаря следующие слова с транскрипцией и переводом. Запомните их произношение и значение.
weight (n.), basis weight (n.), area (n.), wrap (v.), need (v., n.), calculation (n.), unit (n.), square (n.), calliper (n.), thickness (n.), express (v.), inch (n.), bulk (n.), density (n.), inverse (n.), strength (n.).

2. Правильно прочитайте интернациональные слова и дайте их русский эквивалент. Выпишите подчеркнутые слова. Посмотрите их значение в словаре и запомните их.
hydroscopic **['haɪdrəu'skəupɪk]**, equilibrium **[,i:kwɪ'lɪbrɪəm, ,ekwɪ'lɪbrɪəm]**, confusion **[kən'fju:ʒ(ə)n]**, reflectance **[rɪ'flektəns]**, magnesium **[mæg'ni:zɪəm]**, neutralize **['nju:tr(ə)laɪz]**, disperse **[dɪ'spə:s]**.

3. Переведите прилагательные, обращая внимание на их суффиксы -al, -ry, -ic, -ous, -ent, -ant, -ar, -ive.
different, important, typical, rotary, amorphous, basic, chemical, expansive, synthetic, secondary, continuous, similar, extensive, porous.

4. Переведите прилагательные, учитывая значение суффикса -able (-ible, -uble) - способный, подверженный, поддающийся.
available, soluble, usable, predictable, valuable, movable, noticeable.

5. Переведите словосочетания.
standard unit, paper strength, strength requirement, basis weight calculation, basic sheet properties, light scattering potential, surface area.

6. Переведите предложения, учитывая значение сложных союзов either...or - или...или; both...and - и...и.
1) The burning takes place under both oxidizing and reducing atmosphere.
2) The water must either be transmitted from the web in vapour phase or be condensed on fibers.
3) These basic operations are modified to produce either slight or enormous differences in the final product.
4) Trees grow and develop through the division of special cells under the bark that produce both the bark and woody tissue.
5) By softening the chips with steam prior to refining both damage and energy cost can be reduced.
6) Chemical methods for liberation the fibers use either softwood or hardwood, or a blend of the two.

7. Переведите предложения с герундием (см. Приложение II, табл. 7).
1) The test is criticized for not being truly representative.
2) Passing the web under the floor protects it from the possibility of being splashed with any spilled coater.
3) The reason for using the larger sizes of sheet is that the mill will produce the larger size sheet and ship it to the converter.
4) The thickness is often obtained by combining layers during the forming process.
5) Mechanical methods for pulping and liberating fibers produce slightly yellow paper.
6) Cutting the tree into shorter sections makes it easier to handle it.

8. Прочитайте и переведите текст.

Basic sheet properties (1)

Basis weight. The most basic property of the sheet of paper is its basic weight. Paper production is measured in pounds or tons and prices are calculated per pound or ton of material. However, when the paper is used either in communication or packaging, the user is interested in how much surface area is available for the message or to wrap around the product. Therefore there is a need for a basic measuring parameters that is a combination of weight and surface area. Basis weight is just that. Basis weight calculations are expressions of weight of a ream of paper of some standard size. The proposed international standard unit for basis weight is grams per square meter (g/m) which is called grammage.

Calliper. Another basic consideration to the paper processor is the thickness of the paper. The thickness called calliper is usually expressed in thousandths of an inch.

Bulk and Density. Bulk is an expression of volume per unit weight, such as cubic centimeters per gram. Bulk is an inverse of density, expressed in grams per cubic centimeter, pounds per cubic foot or other standard units. Calculation of these properties from the calliper and basis weight requires strict attention to units. Density is used by some as a prediction of paper strength since bonding in the sheet increases both strength and density.

9. Ответьте на вопросы.
1) What is the most basic property of the sheet of paper?
2) Why is the basic weight so important for measuring the paper?
3) How is the thickness of paper expressed?
4) What is the bulk of the paper?
5) What does the thickness of paper predict?

10. Подберите нужный термин к данным определениям.
1) Weight of a ream of paper of some standard size.
2) Expression of volume per unit weight of paper.
3) Expression of weight per volume unit of paper.
(density, basis weight, bulk).

11. Замените пропуски нужным причастием. Переведите предложения.

1) The user ... interested in the surface area and weight of paper, there is a need for a basis weight measurement.
2) The proposed international standard unit for basis weight is ... grammage.
3) The thickness ... calliper is ... in thousandths of an inch.
4) Bonding in the sheet ... strength and density, the last property is used as a predictor of paper strength.
5) (increasing, called (2), being, expressed).

12. Переведите текст письменно со словарем.

The adhesive is needed simply to bind the pigment to the surface of the web and to itself. There are many materials that can satisfy this need. Each adhesive will have its own special advantages and disadvantages when compared with the others; there are also similarities between adhesives. The adhesive is used at relatively low level, generally as low as possible. The final dry coating is not a continuous film, but rather a process structure of pigment particles cemented together at their contact points by dry adhesive. If we use too much adhesive, it begins to fill the voids and reduce the light scattering potential. In this respect all adhesives are similar. Adhesives differ with respect to the amount of adhesive needed to satisfy the strength requirements of the coating.

Урок 8

1. Выпишите из словаря следующие слова с транскрипцией и переводом. Запомните их произношение и значение.

moisture (n.), content (n.), moisture content, range (n.), shift (n.), curl (v.), wrinkle (v.), humidity (n.), tend (v.), noticeable (a.), felt (n.), wire (n.), handle (v.).

2. Правильно прочитайте интернациональные слова и дайте их русский эквивалент. Выпишите с переводом подчеркнутые слова. Посмотрите их значение в словаре и выучите их.

molecule **['mɔlɪkju:l]**, introduction **[ˌɪntrə'dʌkʃ(ə)n]** , separator **['sepəreɪtə]**, hemicellulose **['hemiˌseljəleus]**, commercial **[kə'mə:ʃ(ə)l]**, identical **[aɪ'dentɪk(ə)l]**, nature **['neɪʧə]**, equilibrium **[ˌikwɪ'lɪbrɪəm, ˌekwɪ'lɪbrɪəm]**.

3. Переведите слова с префиксом pre-, означающим предварительное действие.

to presteam, predictable, predominant, to predetermine, preconverted.

4. Переведите слова с префиксом re-, означающим повторность действия.

to recycle, to reuse, to remove, to refill, to resort, replacement, to replenish, reintroduction, recirculation.

5. Прочитайте и переведите словосочетания.

felt side, wire side, handling difficulties, percent relative humidity, wire screen.

6. Переведите предложения, учитывая значение слова cause (n.) - причина, дело, cause (v.) - вызывать, заставлять.

1) The major cause of directionality is stretching of the paper in the direction of travel as it passes through the machine.
2) The presence of the calcium ion in the waste liquor causes problems.
3) Damage of the trees may be caused by allowing them to fall.
4) The water causes the sheet to swell and curl.
5) The pressure on the web causes the surface to be compressed producing a flatter surface.
6) In some cases shifts in the moisture content within the range can cause the paper to curl.
7) As water is absorbed by the paper web, it causes the fibers to swell.

7. Переведите предложения, учитывая значение слова because (cj.) - так как; because of (prep.) - из-за.

1) Bleached sulfite pulp is used in tissue because the fibers can make a softer paper.
2) Cotton is very expensive because of demand for cotton fibers in clothing.
3) Because the sheet of paper is formed on a wire screen, it will have the imprint of the wire on one side.
4) Bleached softwood kraft is used in almost all grades of paper because of its whiteness and strength.
5) Because of large number of grades made it is difficult to group the grade structure in a brief table.
6) Because of the presence of lignin in the fiber the quality can never be raised to the level of chemical pulp.
7) Tearing resistance is understood as a potential problem in the use of paper, but because it is difficult to simulate, testing for this property is not easy.

8. Переведите предложения, обращая внимание на -ing формы (см. Приложение II, табл. 5, 7).

1) The hot liquor being pumped, it forces the cooler liquor towards the outside edge of the digester.
2) The inclined screens allow waters and dispersed ink to pass through while rejecting the fibers and allowing them to be concentrated on the surface.
3) The sulphure is capable of reacting with the lignin to help in its removal.
4) Blowing steam into the chip stream as it is being loaded into the digester helps distribute the chips.
5) The web is deposited on a forming wire at a thickness greater than the final thickness of the product being produced.
6) Different dimensions of the chip are not easily controlled being

dependent on many parameters.

9. Прочитайте и переведите текст.

Basic sheet properties (2)

Moisture Content and Stability

The moisture content of the paper is also of great importance. Paper normally has about 5% moisture in it when dry, but that value can range from 3% to 7% depending on the type of paper and the material used in its manufacture. In some cases shifts in moisture content within this range can cause the paper to curl, wrinkle, change dimensions or lose strength and can create other handling difficulties. Since paper is made in water and since it is made of cellulose, which is highly hydroscopic, paper will take on water from the atmosphere or lose it to the atmosphere if the two are not in balance. The paper should therefore be made with a moisture content that will be in equilibrium with the conditions where it will be used. Since paper will arrive at equilibrium with the moisture in the air, the moisture content is sometimes expressed as the percent relative humidity at which the paper will be stable. The moisture content is normally measured by drying the paper to constant weight at 100 C.

Felt and Wire Side

The paper machine and its operation also build some characteristics into the sheet of paper. The first of these is the difference between the felt side and the wire side. Because the sheet is formed on a wire screen, it will have the imprints of the wire on one side. The side that is formed next to the wire is called the wire side. The top side which is transferred to a felt when the paper was made by hand is called felt side. However, many modern paper machines press the paper with felts on both sides, and an increasing number of machines form the sheet of paper between two wires. All that makes confusion as to which side is the felt and which the wire. The difference between two sides becomes important if one side is smoother than the other or if the sheet tends to curl in one direction. If this difference is noticeable, the sheet is called two sided.

10. Ответьте на вопросы.

1) What moisture content does the paper have?
2) What does the moisture content of the paper depend on?
3) Why does the paper take the water from the atmosphere?
4) What moisture content must the paper have?
5) What is the wire side of the paper?
6) What is the felt side of the paper?
7) What sheet of paper is called two sided?

11. Замените пропуски нужными -ing формами и переведите предложения.

1) The paper ... made of water and cellulose, it will take water from the atmosphere or lose it to the atmosphere.
2) The paper ... at equilibrium with the moisture in the air, the moisture content is expressed as the percent relative humidity.
3) The moisture content is normally measured by ... the paper to constant weight at 100 C.
4) An ... number of machines form the sheet of paper between two wires.
5) (increasing, being, drying, arriving).

12. Переведите письменно со словарем.

Starches are the largest category of adhesives, because they are the most used and available in a wide range of grades. Although starch can be obtained from many sources, most is made from corn and potatoes. Natural cornstarch is too high in viscosity to be used and must therefore be converted in some way. The largest tonnage (количество) is converted in the mill, primarily by the use of enzymes that shorten the molecular chains, thereby reducing viscosity. Other chemical modifications that also allow control of viscosity and, in some cases, even alter final coating properties can be made in the mill. Starches can also be purchased from suppliers in a preconverted form, having already been treated to modify the viscosity and usually also the chemistry of the starch molecule.

Урок 9

1. Выпишите из словаря следующие слова с транскрипцией и переводом. Запомните их произношение и значение.

log (n.), hold (held, held) v.), represent (v.), intermediate (a.), common (a.), summarize (v.), contribute (v.), reduction (n.), size (n.), break down (v.), prevent (v.), damage (n.), spend (spent, spent) v.), burn (v.), emit (v.), pollution (n.), regulations (n. pl.), evaporation (n.).

2. Переведите слова, образованные с префиксами избыточности over-, super-, hyper-, ultra-, extra-, multi-, и префиксами недостаточности under-, sub-.

overcooked, oversize, multistage, suboperation, undercooked, supercalendering, underestimate, suboptimal, overheating, multicylinder, extraordinary.

3. Переведите слова, учитывая значение словообразовательных элементов.

contribute (v.), contribution (n.)
reduce (v.), reduction (n.)
pollute (v.), pollution (n.)
vapour (n.), evaporate (v.), evaporation (n.).

4. Прочитайте и переведите словосочетания.

chemical recovery system, lignin molecule, basic building block component, kraft liquor recovery system, highly unpleasant smelling sulphur compounds, pollution regulations, groundwood process, lignin reaction products, evaporation techniques, recovery boiler.

5. Переведите предложения, обращая внимание на слова with (prep.) – с, which (pron.) – который.

1) Each of paper products requires certain unique properties which must derive from the raw material.
2) The chips are integrated with white cooking liquor.
3) The sizing materials are usually starch solutions which are applied as the web is passed between two rollers.
4) The final moisture content of the paper is about 5% - the average moisture content at which paper is in equilibrium with the atmosphere.
5) One of the limiting factors in the rate of evaporization is the speed with which the water vapour can be removed.

6. Переведите предложения, учитывая значение слова number (n.) – число, номер, a number of – ряд, несколько.

1) The only way to increase the strength of the sheet of paper is to increase the number of bonds between fibers.
2) Since their introduction in 1950's, the coaters have gone through a number of improvements.
3) A great number of properties and characteristics of paper and paperboard products are related to their manufacture and use.
4) These drum barkers can handle a large number of logs.
5) Dividing the weight of the stock by the number of reams gives us the weight per ream.
6) This coater does a number of operations: it meters the coating, smoothes it and then applies in on the web.

7. Переведите предложения, учитывая перевод -ing форм (см. Приложение II, табл. 5, 6, 7).

1) The sodium sulphide provides sulphur to react with the lignin building blocks, making them more soluble.
2) Mechanical pulping can be achieved by grinding or refining.
3) The chips settling down through the digester, the liquor begins to penetrate them.
4) Maintaining a constant load on the stone is important.
5) To determine the relative amount of cutting it is necessary to know the consistency of the stock being refined.
6) Foam flotation processes operate on low consistency stock suspension, with the ink being collected by the foam and removed from the fibers.
7) When making papers for communication we are interested in how well the paper will be able to carry the message and display it to the reader.

8. Прочитайте и переведите текст.

Pulping chemistry and properties (1)

The groundwood process removes the fibers from the tree by mechanical method completely: barked logs are held against an abrasive stone, which tears the fibers from the log, and water is used to wash the fibers from the stone.

The opposite method is represented by the full chemical process in

which the fibers are removed completely by chemical means. The full chemical processes, kraft and sulphite, remove the fibers from the wood by dissolving the lignin that holds then together in the tree. The mechanical pulp will be weaker and less permanent and will require more energy to produce, while the chemical pulp will be the opposite. There are many pulping processes that use a combination of chemical and mechanical energy and produce pulp with intermediate properties.

Kraft pulping

The Kraft pulping process has become the most common process for the production of full chemical pulp. The reasons are: 1) the strength of pulp, 2) the versatility of the process: it can handle a wide range of raw materials and 3) the ready availability of a chemical recovery system.

The chemistry of the Kraft process can be summarized in the following manner: the sodium hydroxide contributes to the reduction in size of lignin molecules or breaks the lignin down into basic building block components. The sodium sulphide contributes to the maintenance of the desired pH level and helps to buffer the reaction of the caustic with the wood to prevent or reduce damage to the pulp. The sodium sulphide also provides sulphur to react with the lignin building blocks making them more soluble. Both the caustic and sodium sulphide contribute sodium ions which help in removal of the lignin reaction products from the wood.

After the pulping operation, the spent cooking liquor is removed from the pulp and burned to recover the cooking chemicals. The Kraft liquor recovery system consists of first thickening the spent liquor (black liquor) through several evaporation techniques, and subsequent burning of the thickened liquor in the recovery boiler. The burning takes place under both oxidizing and reducing atmospheres.

One of the disadvantages of the Kraft process is that small amount of highly unpleasant-smelling sulphur components are emitted. Kraft pulp mills have to control these emissions. These emissions comply with air pollution regulations.

9. Ответьте на вопросы.

1) How does the groundwood process remove the fibers from the tree?
2) How are the fibers removed from the wood by chemical processes?
3) What is the difference between mechanical and chemical pulps?
4) Why has the Kraft process become the most common chemical process?
5) What part does the sodium hydroxide play during the Kraft process?
6) What is the role of the sodium sulphide in the Kraft process?
7) What does the Kraft liquor recovery system consist of?
8) What is one of the disadvantages of the Kraft process?

10. Замените пропуски нужными -ing формами и переведите предложения.

1) The lignin ... the fibers together is dissolved by some chemicals.
2) The sodium sulphide makes the sulphur to react with the lignin ... it more soluble.

3) The burning of the thickened liquor takes place under ... and ... atmospheres.
4) Unpleasant ... sulphur compounds ... during the chemical process, the Kraft pulp mills have to control these emissions.
5) (smelling, making, holding, oxidizing, reducing, being emitted)

11.Переведите текст письменно со словарем.

The Kraft process is basically an alkaline cook, with sodium hydroxide being the primary cooking chemical. The first alkaline process was called the soda process and produced pulp by cooking chips in a sodium hydroxide solution with a pH of about 12. The wood, when it is cooked, will release acids into the cooking solution to reduce the pH during the cooking process. The NaOH can enter into several different reactions with the wood. If the pH is decreased during the cook, the result will be degradation of the cellulose and loss of pulp quality. This quality reduction can be counteracted by increasing the initial caustic concentration in the cooking liquor. However, too high a concentration of NaOH at the beginning of the cook can also be harmful to the chips. The solution to the problem was found through using sodium sulphite (Na S) which functions as a buffer or caustic donor.

Урок 10

1. Выпишите из словаря следующие слова с транскрипцией и переводом. Запомните их произношение и значение.

similar (a.), pressure (n.), cooking (n.), acid (n.), waste liquor (n.), thicken (v.), scale (n.), plug (v.), considerably (adv.), favour (v.), decline (n.), cooking liquor (n.), recovery (n.).

2. Правильно прочитайте интернациональные слова и дайте их русский эквивалент. Выпишите подчеркнутые слова. Посмотрите их значение в словаре и выучите их.

sulphur dioxide **['sʌlfə] [daɪ'ɔksaɪd]**, calcium **['kælsɪəm]**, ammonia **[ə'məunjə]**, operation **[ˌɔp(ə)'reɪʃ(ə)n]**, stationary **['steɪʃnərɪ]**, period **['pɪərɪəd]**, suspension **[səs'penʃ(ə)n]**, sort **[sɔ:t]**, sodium hypochlorite **['səudjəm] ['haɪpə'klɔ:raɪt]**.

3. Переведите однокоренные слова, исходя из значений словообразовательных элементов.

cook (v.), cooking (n.), cooking liquor
dissolve (v.), solution (n.), soluble
burn (v.), burning (n.)
permanence (n.), permanent
similar (a.), similarity (n.).

4. Переведите предложения, учитывая значение слова only (a.) - единственный (the only); (adv.) - только.

1) If the ink is adhering only to the coating, the ink can simply be wasted off the paper.
2) Chemical and mechanical pulps differ not only in the properties of the pulp but also in the yield of the operation.
3) Strength difference is not the only reason for preferences for Kraft pulping.
4) The only solution is to wait that the cost of virgin pulp falls.
5) The only technique of deinking at this mill is foam flotation.
6) The chemicals not only help to break up the paper, but also help to disperse the ink.
7) Groundwood and secondary fiber pulps frequently receive only one stage bleach.

5. Переведите предложения, учитывая значения слова function (n.) - функция, (v.) - действовать, to be function of - зависеть от.

1) Heating the chips and the inside of the digester is an important function of the presteam operation.
2) The peroxide stage is suited to high consistency because the peroxide still functions well when released as a gas in the bleach tower.
3) The number of dryers needed is a direct function of the amount of waters that must be evaporated.
4) The wet strength agent functions in the web to protect the bonding and helps to hold the fibers together when the web is wetted.
5) The functions of mechanical refining can be combined into one, that of promoting bonding in the sheet.

6. Переведите предложения, учитывая значение многофункционального слова "that" (см. Приложение II, табл. 15).

1) The properties of the sulphite pulp are quite different from those of the Kraft pulp.
2) Within each operation there are several parallel routes that may be taken.
3) The fibers of the sulphite pulp make paper that is softer and smoother than that from Kraft pulps.
4) The pressure that develops in the digester may become greater than that due only to steam pressure.
5) The quality of the pulp produced by these operations is similar, but not identical to that of stone groundwood.

7. Переведите предложения, учитывая перевод инфинитива в разных функциях (см. Приложение II, табл. 8).

1) Many different forms of machines are used to produce different grades of paper.
2) There are basically two results to be obtained from refining: cutting and fibrillation.
3) The high yield process uses chemical treatment and some mechanical treatment to liberate the fibers.
4) It is necessary to maintain a storage facility to ensure continued operation.
5) To ensure a continuous flow of pulp for the subsequent operation it is generally necessary for a mill to have several digesters.
6) To ensure a continuous flow of pulp is the main aim of the mill.
7) To heat the digester and to load the chips is necessary during the cooking process.

8) The first coater to be used is the size press.
9) The final benefit to be obtained from pigmented coating is a possible improvement in gloss.

8. Прочитайте и переведите текст.

Pulping chemistry and properties (2)

2. Sulphite pulping

The sulphite pulping process is completely opposite to Kraft pulping in some ways and similar in others. They are similar in the use of high temperatures and pressures during cooking and in the use of sulphur compounds to help remove the lignin. The sulphite process uses sulphur dioxide (SO) dissolved in water to produce an acid condition to help break down the lignin. The cooking liquor is pressed by burning sulphur in a controlled atmosphere to produce sulphur dioxide, which when dissolved in water forms a weak acid which will react with the lignin. The reaction not only breaks the lignin into smaller parts, but also forms molecules called lignosulphonic acids. These acids can be dissolved from the wood.

Calcium was originally the preferred base because of its low cost and availability. However the presence of the calcium ion in the waste liquor causes problems. After cooking, the waste pulping liquor is thickened by evaporation until it is thick enough to burn. The burning can be controlled to give back original chemicals which can be used to make new pulping liquor. However the calcium can cause scale and can plug pipes quickly. Newer sulphite operations are being built to use sodium, magnesium or ammonia as the base with fairly good results.

The properties of the sulphite pulp are also quite different from those of the Kraft pulp. The fibers produced are considerably whiter and are used directly in paper or board applications where high brightness is not needed. The fibers can also make paper that is softer or smoother than that from Kraft pulp. The other factor is that sulphite pulping operations leave behind fibers that have more pure cellulose in them. If the pulping operation is followed by bleaching, the resultant pulp is brighter and purer than Kraft pulp and will give paper greater permanence than Kraft. Because of the potential pollution and recovery problems, however, sulphite pulp is less favoured than Kraft and is in decline as a major pulping operation.

9. Ответьте на вопросы.

1) What are the sulphite process and the Kraft process similar in?
2) How is the lignin broken down during the sulphite process?
3) How is the cooking liquor prepared during the sulphite process?
4) Why is calcium replaced by sodium, magnesium or ammonia in the newer sulphite operations?
5) What are the properties of the sulphite pulp compared to the Kraft pulp?
6) Why is sulphite pulp less favoured than Kraft pulp?

10. Закончите предложения, учитывая нужные обстоятельства цели, выраженные инфинитивом.

1) The sulphite process uses sulphur dioxide dissolved in water ... .
2) The burning of the waste liquor can be controlled ... .
3) Original chemicals can be used ....
   a) to make new pulping liquors
   b) to produce an acid condition to help break down the lignin
   c) to give back original chemicals.

11. Замените пропуски нужной причастной формой. Предложения переведите.

1) Sulphur dioxide when ... in water forms a weak acid.
2) After cooking, the waste ... liquor is ... by evaporation.
3) Newer sulphite operations are ... to use sodium or ammonia as the base.
4) If the pulping operation is ... by bleaching, the pulp is brighter than Kraft pulp.

(followed, pulping, resultant, dissolved, thickened, being built).

12. Переведите текст письменно со словарем.

The coating mill has a separate department or area, where the coating is prepared. Each mill must develop its own system and equipment based on the grades to be produced and the types and complexity of raw materials to be processed. Pigment dispersions must be prepared, unless they are purchased in the slurry form. If soluble adhesives are to be used, there must be equipment for their preparation. Once ready for use, the two must be metered together, blended, screened, stored and pumped to the application system. The simplest system could be tanks to receive and store slurry pigments and latex emulsions; more complex systems need adhesive cooking equipment and perhaps several tanks for pigment dispersion as well as storage tanks for these ingredients after they are prepared.

Урок 11

1. Выпишите из словаря следующие слова с транскрипцией и переводом. Запомните их произношение и значение.

batch pulping (n.), chip (n.), continuous pulping (n.), carry out (v.), sequential (a.), feed (fed, fed) (v.), load (v.), digester (n.), conclusion (n.), empty (v.), fill (v.), blow (v.), bin (n.), supply (n.), storage (n.), lid (n.), chute (n.), bridging (n.), valve (n.), dump (v.).

2. Правильно прочитайте интернациональные слова и дайте их русский эквивалент. Выпишите подчеркнутые слова. Посмотрите их значение в словаре и запомните их.

tank **[tæŋk]**, mount**[maunt]**, distributor**[dɪs'trɪbjətə]**, condensates **[kən'denseɪts]**rotation**[rəu'teɪʃ(ə)n]**, integral **['ɪntɪgr(ə)l]**, chlorine **['klɔrin]**, peroxide**[pə'rɔksaɪd]**.

3. Прочитайте ряды однокоренных слов. Переведите их, исходя из значения словообразовательных элементов.

charge (v.), discharge (v.)

conclude (v.), conclusion (n.)
screen (n.), screen (v.), screening (n.)
steam (n.), presteam (v.), presteaming (n.)
dilute (v.), dilution (n.)
moist (a.), moisture (n.).

4. Прочитайте и переведите словосочетания.
biological oxygen demand, chip bin, chip storage area, level filling, chip stream, pulping operation, cooking room floor, liquor supply system, chip distributor, moisture content.

5. Переведите предложения, учитывая значение предлогов for - для, в течение и from - от, из.
1) All paper products are made from fibers which must be removed from the raw materials.
2) Following these simple steps may suffice for the making of simplest grades of paper.
3) The initial material for paper manufacturing may be anything from logs to wastepaper.
4) Mechanical methods for pulping or liberating fibers produce slightly yellow paper.
5) Most grades of paper and paperboard are made from a blend of different pulp types.
6) The oldest machine for making lightweight paper is the fourdrinier.

6. Переведите предложения, учитывая особенности перевода инфинитива (см. Приложение II, табл. 8).
1) The mat is pressed and dried to complete the transformation of paper.
2) The stock to be washed is introduced into a tank under the washing drum.
3) The deinking operation begins in the pulper with the selection of the chemicals to be added there.
4) There is a need to modify the physical shape of the web to suit the consumer's need by rewinding or sheeting.
5) Many forms of paper can be reused, but each requires a slightly different treatment to be used effectively.
6) It is the goal of refining to break down the ordered structure of the fiber, to expose more hydroxyl groups for bonding.

7. Прочитайте и переведите текст.

Batch pulping (1)

Methods for cooking the chips can be divided into two basic types of operations: batch and continuous. As the names imply the batch operations are carried out as sequential cooking steps and the continuous are carried out in a special tank that allows the chips to be fed in at one end and cooked pulp to be discharged at the other.

For the batch operation the chips are loaded into a tank called a digester. The digester is sealed; the cooking liquor is charged into the digester, the pulping operation is carried out, and at the conclusion of

the cook, the digester is emptied and refilled for the next cycle. To ensure a continuous flow of pulp for subsequent operations, it is generally necessary for a mill to have several digesters usually mounted side by side on the digester or cooking room floor and operated with one chip supply and one liquor supply system.

The chips are delivered to the chip bin from the chip storage area following the necessary screening operations. When it is necessary to charge, or fill a digester, the lid is removed from the digester, the chute placed in position to fill it and the chips dumped into the digester. It is desirable to use a chip distribution to spread the chips out to ensure level filling of the digester and prevent bridging or formation of dome-shaped piles in the digester.

It is necessary for the chips to be presteamed to heat them or to increase their moisture content. Presteaming can easily be accomplished in the digester by opening the steam valves leading to it and blowing steam in among the chips. Presteaming can also be accomplished during the loading cycle by blowing the steam into the chip stream as it is being loaded into the digester.

Heating the chips and the inside of the digester is another important function of the presteaming operation. If, for example, a load of cold chips is put into cold digester and steam or hot liquor is pumped in, the steam will condense and dilute the cooking liquor. Therefore it is desirable to have some means of removing condensates from the digester before the cooking liquor is added.

8. Ответьте на вопросы.
1) What are the batch process and the continuous process of cooking the chips?
2) Where is the pulping operation carried out?
3) How is the process of pulping carried out?
4) Why is it necessary to have several digesters at a mill?
5) How are the chips delivered in the digester?
6) Why is it desirable to use a chip distributor?
7) What is the function of the presteaming operation?

9. В следующем ряду найдите пары слов, противоположных по значению.
to fill, to discharge, to empty, continuous, batch, to charge, hot, cold, to ensure, to prevent.

10.В следующем ряду найдите пары слов близких по значению.
to feed, moist, to remove, to load, wet, to displace.

11.Переведите текст письменно со словарем.

The water used in the papermaking process becomes high in biological oxygen demand (BOD) and suspended solids and must be treated before discharge into a receiving stream (rivers, lakes etc.). Water quality regulations restrict the pollutants that a mill can discharge. Since raw, untreated wastewater from a mill normally far exceeds permitted levels of pollution, as much as 90% of the pollutants have to be removed before discharging. Naturally, the first step in

controlling effluent discharge is to reuse as much of the wastewater as possible. However there are limitations on internal reuse, so most mills have extensive primary and secondary wastewater treatment plants. Primary treatment consists of removing suspended solids by settling in a clarifier. Secondary treatment to remove organic materials or BOD is normally done by treating the effluent with oxygen in large basins. The oxygen, along with bacteria, oxidizes the organic materials, thus lowering the BOD.

Урок 12

1. Выпишите из словаря следующие слова с транскрипцией и переводом. Запомните их произношение и значение.

heat (n.), dilute (v.), external (a.), accomplish (v.), plate (n.), arrangement (n.), heat exchanger (n.), return (v.), release (v.), additional (a.), accumulate (v.), secure (v.), associate (v.).

2. Переведите ряды слов, обращая внимание на значение словообразующих элементов.

loss (n.), lose (v.)
heat (v.), heater (n.), heating (n.), heat exchanger (n.)
accomplish (v.), accomplishment (n.)
arrange (v.), arrangement (n.), range (n.)
desire (v.), desirable (a.), undesirable (a.)
remove (v.), removal (n.)
give (v.), give off (v.)
add (v.), addition (n.), additional (a.).

3. Переведите словосочетания.

chip structure, screen plate, digester wall, average chip size, sulphur dioxide gas.

4. Переведите предложения, учитывая значение сложных союзов: as well as - так же как, as long as - пока, as soon as - как только.

1) The penetration of water into the web is dependent on the pore structure of the web as well as on the contact angle of the liquid and the fiber surface.
2) Rivers have been used to transport logs to the mill almost as long as there have been mills.
3) The volatile gases carry with them undesirable odors as well as harmful elements.
4) It is possible to monitor the chips going in as well as the liquor recirculating through the heater.
5) As long as the incoming materials are maintained at the desired levels, the output will remain constant.
6) The concentration of dye in the whitewater varies with the amount used as well as the type of the dye.
7) As soon as the web contacts the hot dryer, water will be evaporated from the web's surface.

5. Переведите предложения, учитывая особенности перевода инфинитива (см. Приложение II, табл. 8).

1) It may be necessary to introduce steam to complete the blowing of the chips from the digester.
2) The logs need to be reduced to small chips to allow the cooking liquor to penetrate the fibers and dissolve the lignin.
3) To better understand this behaviour of the fibers, it is desirable to study the structure and nature of the fiber.
4) It is possible to bleach the groundwood pulp to improve the whiteness of the paper to be produced.
5) The first phase of drying operation is to raise the material to be dried to the evaporation temperature.

6. Прочитайте и переведите текст.

Batch pulping (2)

When the digester is filled, the chute is removed and the lid placed on the top of the digester. The lid is usually a steel flange which is secured to the top of the digester. The cooking liquor can then be pumped into the digester. Usually, however, there will be not enough heat present in the liquor to make the entire digester and load of chips hot enough to carry out the cooking operation. Therefore it is necessary to heat the digester and its load during the cooking process. Steam can be used to heat the digester, however, the steam will dilute the liquor. Therefore it is desirable in many cases to resort (прибегнуть к) the external liquor heating. External liquor heating is accomplished by an arrangement of screen plates in the digester wall to allow the removal of liquor without loss of any of the chips. The liquor is then pumped to a heat exchanger, which will heat the liquor to a desired temperature and return it to the digester.

During the cooking operation the temperature in the digester will rise to the desired degree and then the heater will be cut off or stopped. Increased temperature in the digester will cause the chips to give off steam and other gases which will contribute to an increase in pressure inside the digester. The pressure that develops in the digester may become greater than that which would normally be associated with the temperature due only to the steam pressure. This is especially true in the sulphite process, where sulphur dioxide is present in solution in cooking liquor. Since sulphur dioxide is less soluble in hot cooking liquor that in cold, when the temperature of the cooking liquor is increased, sulphur dioxide gas is released and must be removed from the digester. Sulphite pulping operations therefore will have additional tanks, which are used to accumulate this sulphur dioxide gas as it is released from the digester.

The temperature and time used in the digester vary greatly with the type of process and type of wood being cooked, as well as with strength, or amount of cooking that is desired.

7. Ответьте на вопросы.

1) How is the digester closed after filling?
2) Why is it necessary to heat the digester during cooking process?

3) How is the cooking liquor heated?
4) What contributes to an increase in pressure inside the digester?
5) Why is it necessary to have additional tanks in sulphite pulping operations?
6) What do temperature and time in the digester vary with?

8. Из данного ряда подберите пары слов с противоположным значением.

to thicken, to release, to heat, to accumulate, to dilute, to cool, desirable, to heat, undesirable.

9. Из данного ряда подберите пары слов, близких по значению.

to carry out, to associate, to cut off, to realize, to stop, to relate.

10. Переведите текст письменно со словарем.

It must be remembered that the main purpose of the cooking operation is to cause the liquor to penetrate the chips, dissolve the lignin and break down the chip structure. The liquor penetrates the chips partially by capillary action, but also due to the pressure that exists in the digester. As the cooking chemicals penetrate the chips, they react with the lignin in the chip or in the fiber walls and also with the cellulose in the fibers. If the cooking cycle is not allowed to last long enough, the chips will not be completely cooked. If, on the other hand, the cooking cycle lasts too long, considerable degradation of the fibers will result. It is also possible than an overcooked pulp will become too darkly colored.

If we feed the digester a mixture of large and small chips, some chips in the mixture will be so large, that they will be never completely cooked. The time, temperature and cooking liquor concentration therefore must be designed to suit the average chip size in the digester.

Урок 13

1. Выпишите из словаря следующие слова с транскрипцией и переводом. Запомните их произношение и значение.

keep (kept, kept (v.), maintain (v.), bottom (n.), push (v.), blowtank (n.), blowchest (n.), impingement (n.), drain (v.), volatile (a.), odor (n.), confession (n.), knot (n.), washer (n.), facilitate (v.), fuel (n.), mesh (n.).

2. Переведите ряды слов, обращая внимание на значение словообразовательных элементов.

tank (n.), blowtank(n.)
drain (v.) – drainage (n.)
convert (v.) – conversion
wash (v.), washer (n.), washing (n.)
impinge (v.), impingement (n.)
maintain (v.), maintenance (n.).

3. Переведите словосочетания.

large mesh wire screen, batch type operation, pulp washer, waste liquor furnace.

4. Переведите предложения, учитывая значение наречий: therefore – поэтому, accordingly – соответственно, however – однако, furthermore – кроме того, thereby – тем самым.

1) The softwood has longer fibers and therefore facilitates the production of stronger paper.
2) However, the longer fibers of the softwood may also be larger in diameter and thereby produce the paper that will be rough on the surface.
3) Each tree forms its own type of cells. However, the difference between some species is too small to affect the properties. Therefore we group wood fibers in two major categories: hardwood and softwood.
4) The paper term "opacity" is an indication of the degree of opaqueness. Accordingly, opacity is expressed as a percentage.
5) Cotton fibers give paper strength and permanence and therefore are valuable for use in money paper.
6) The tree produces different forms of fiber. Furthermore, hardwoods and softwoods contain different types of fibers or cells.

5. Переведите предложения, учитывая особенности перевода инфинитивных оборотов (см. Приложение II, табл. 9).

1) The manufacture wants the machine to produce a uniform web with uniform specific properties.
2) Wood fibers are well known to consist of cellulose.
3) Refining that leads to fibrillation is seen to have mixed effects on the paper.
4) The pulper is more likely to be operated as a batch operation.
5) The fibers of sulphite pulp can be said to be cream coloured.
6) Too high concentration of NaOH at the beginning of the cook proves to be harmful to the chips.
7) Pulp mill operations are considered to operate 24 hr/day without interruption.

6. Прочитайте и переведите текст.

Batch pulping (3)

When it is time to finish cooking, the top lid of the digester is kept in place maintaining the pressure inside the tank. The low valve on the bottom of the digester can be opened and the pressure inside the digester is then used to push or blow the cooked chips from the digester through the pipe and into the blowtank. The combination of release of pressure from the digester and impingement on the wall of the blowtank breaks down the chips into individual fibers. As the chips blow from the digester, it may be necessary to introduce steam to complete the blowing of the chips from the digester or it may be necessary to add waste cooking liquor to flush (смыть) the remaining chips from the digester. When the digester is emptied, the lid is removed and the next cooking cycle may begin with the loading of new chips in the digester.

The blowtank originally was an open tank with porous bottom to allow the spent cooking liquor to drain through the pulp. The use of an

open blowtank presents a considerable pollution problem. Since the pulp, when it is released from the pressure of the digester to the atmospheric pressure, will flush off steam and undesirable volatile gases, the volatile gases will carry with them odors as well as chemicals. The batch type operation of a blowtank that subjects it to large blasts of pressurized chips has led to pollution problems and has been one of the contributing factors to the conversion from batch to continuous pulping by many industries.

The pulp goes from the blowtank through a screen to remove knots and uncooked chips and on the pulp washer. The screen used in this position can be drilled plate or a large-mesh wire screen usually vibrated to facilitate passage of pulp and remove the oversize material from the surface. The knots chips and uncooked pieces of wood removed from the stock on the screen can be either sent through the digester again or used as a fuel in the waste liquor furnace.

7. Ответьте на вопросы.

1) How is the removal of the cooked chips carried out when the cook is finished?
2) Where are the cooked chips blown from the digester?
3) What process takes place during the removal of the cooked chips from the digester?
4) What is used in order to complete the blowing of the chips from the digester?
5) What did the blowtank represent originally?
6) Why did many industries replace the batch pulping by the continuous pulping?
7) Where does the pulp go from the blowtank?
8) Where can the uncooked chips and knots be reused?

8. Замените пропуски нужным словом и переведите предложения.

1) ... on the wall of the blowtank breaks down the chips into individual fibers.
2) The spent cooking liquor ... through the pulp.
3) The volatile gases carry with them ... as well as chemicals.
4) The pulp goes through a screen to remove ... and on the pulp ... .
5) The screen is vibrated to ... the passage of pulp.
(facilitate, knots, odor, washer, the impingement, drains).

9. Переведите текст письменно со словарем.

The coating method used is largely dependent on the grade of paper or paperboard being produced. The speed at which the machine must be run to be economically competitive is also important, as is the effect that the application system may have on the surface of the coating. The coating operation may be performed on the paper machine with the coater being an integral part of the machine, or it may be an off-machine operation.

All application systems need to perform three related functions: 1) the coating must be applied uniformly to the entire surface of the web, leaving no uncoated areas; 2) the amount of coating on the surface must be metered to ensure that it is the desired thickness; 3) the surface should be made as smooth and uniform as possible. Some coaters are designed to combine all of these functions.

Урок 14

1. Выпишите из словаря следующие слова с транскрипцией и переводом. Запомните их произношение и значение.

waste (n.), drum washer (n.), wire (n.), stock (n.), pad (n.), shower (n.), locate (v.), mix (v.), offset (v.), spray (v.), displacement (n.), countercurrent (n.), continuous (a.).

2. Переведите ряды слов, обращая внимание на значение словообразовательных элементов.

screen (n.), screen (v.), screening (n.), screener (n.)
rotate (v.), rotation (n.), rotary (a.)
locate (v.), location (n.)
mix (v.), mixture (n.), mixer (n.)
part (n.), partial (a.)
continue (v.), continuous (a.)
flow (n.), flow (v.), counterflow (n.).

3. Переведите словосочетания.

white water balance, waste treatment plant, typical stock washing operation, rotary drum washer, drum surface, displacement washing, counterflow washing principle.

4. Переведите предложения, учитывая разное значение слова time – 1) время; 2) раз.

1) The invention of the paper in 105 A.D. is recorded as the first time when the present method of fabrication was used.
2) Titanium dioxide costs about 10 times as much as clay.
3) As light passes through the sheet of paper, it is scattered every time it passes from the air into the fiber.
4) The worker repeated the operation many times.
5) The chips at this time are fully cooked and can be washed in the digester.
6) The temperature and time used in the digester vary greatly with the type of process.
7) The time for the Kraft cook is shorter than that for the sulphite pulp.
8) The time, temperature and cooking liquor must suit the average chip size in the digester.
9) It is impossible to form the entire web at one time and still keep the layers separated.

5. Переведите предложения, учитывая особенности перевода инфинитивных оборотов (см. Приложение II, табл. 9).

1) Longer fibers are more likely to clump together and to cause wild formation.
2) The pulp bleached with a final peroxide stage is less likely to yellow later.

3) Bleaching is said to perform two functions: it removes lignin from the fibers and purifies the stock.
4) Mechanical pulps are not likely to be sole pulp used, they are blended with stronger whiter grades.
5) Cloth paper is said to have been made thousands of years ago in South and Central America.
6) As the less industrialized nations become more developed, the demand for paper is expected to grow.
7) They consider the fibrils of the outer secondary cell wall to be laid down in a crisscross pattern.

6. Прочитайте и переведите текст.

Pulp washing

Following the cooking and screening operations it is necessary to remove the waste liquor from the stock to produce high-quality pulp. A typical stock washing operation is the following. The rotary drum washer is designed such that the stock to be washed is introduced into a tank under the washing drum. The water of the stock passes through a wire screen on the surface of washing drum causing a pad of fibers to build up on the drum surface. The pad of fibers is raised up out of the tank by the rotation of the drum and washed further by showers located above the drum. The washed stock can be removed from the drum surface, mixed with water and pumped on to the next operation. The vacuum drum is divided into sections to allow the use of a partial vacuum inside the drum. The vacuum must be increased, as the thickness of the pad increases. As the drum continues to rotate, the vacuum may continue to remove water from the bottom of the pad as showerwater is being sprayed on the top. Such operations are called displacement washing. The water in the pulp is displaced by the cleaner water from the showers.

The counterflow washing principle is the following. The dirtiest stock is introduced into the first washer and is washed with the dirtiest water, which was obtained from the washing operation in the second washer. The countercurrent flow of washwater and the stock allows us to minimize the amount of fresh water required, and also increases the concentration of the chemicals in the wastewater removed from the first washer.

From this point in the treatment of the pulp, there is no difference between batch and continuous cooking operations.

7. Ответьте на вопросы.

1) What is the aim of the washing operation?
2) Where does the washing take place?
3) How is the stock introduced in the washer?
4) Where does the water of the stock pass through?
5) How is the pad of fibers raised up out of the tank?
6) Where does the washed stock go from the drum washer?
7) How can the vacuum in the drum be regulated?
8) What is the aim of the counterflow washing?

8. Из данного ряда подберите пары слов, близких по значению.

spent liquor, stock, counterflow, waste liquor, countercurrent, pulp.

9. Из данного ряда подберите пары слов, противоположных по значению.

top, open, complete, bottom, batch operation, close, partial, continuous operation.

10.Переведите текст письменно со словарем.

The management of the whitewater balance on the wet end of the machine is extremely important to the economic success of the mill. The material balance also emphasizes the dependence of the industry on an adequate water supply. The location selected for a mill must have water. Fibers can be shipped in from other locations, but there must be water at the mill site. Even with the large amount of water needed in the wet end of the machine the total consumption of the mill will be below that level due to recirculation within the mill. The actual amount of water required depends on how well the water is reused in the mill and what other operations are performed there, such as pulping, bleaching and coating. Based on 1972 average figures, a mill making 100 tpd of paper would recirculate about 6 million gallon per day (gpd) through the headbox and requires about 2 million gpd of fresh water and sends a similar volume to the waste treatment plant.

Урок 15

1. Выпишите из словаря следующие слова с транскрипцией и переводом. Запомните их произношение и значение.

continuous digester (n.), breakdown (n.), fit (v.), allow (v.), area (n.), meter (n.), vessel (n.) become (v.), feeder (n.), push (v.), valve (n.), force out (v.), separator (n.), bin (n.), pocket (n.), perform (v.).

2. Переведите ряды слов, обращая внимание на значение словообразовательных элементов.

nature (n.), natural (a.)
introduce (v.), introduction (n.)
modify (v.), modification (n.)
determine (v.), determinant (a.), determined (a.)
carry (v.), carrying (a.), carried (a.)
push (v.), pushing (a.)
meter (v.), meter (n.)
become (v.), becoming (a.)
allow (v.), allowing (a.).

3. Переведите словосочетания.

digester area, chip storage, chip moisture, cooking time and temperature, batch operation, flow rate, chip bin, low-pressure meter, high-pressure valve, full strength cooking liquor.

4. Переведите предложения, учитывая значения наречий и предлогов out - adv. - наружу, завершение действия;

out of - prep. - из, off - завершение действия: run off - убежать, вытекать, give off - выделять, выпускать, cut off - прервать.

1) The heater is cut off and stopped.
2) The pad of fibers is raised up out of the tank by the rotation of the drum and showers located above the drum.
3) Increased temperature in the digester causes the chips to give off steam and other gases.
4) Any gases being removed from the top of the tank may be given off.
5) The chips are forced out and carried up to the chip separator at the top of the digester.
6) When the liquor is pumped in, it may run off the top of the cone, much the same as rain runs off the roof of a building.

5. Переведите предложения, обращая внимание на глаголы "should" и "would" (см. Приложение II, табл. 10, 11).

1) The surface of the web should be made as smooth and uniform as possible.
2) If it was necessary for the chips to be presteamed, the presteaming would take place in the digester.
3) If a load of cold chips were put into a cold digester and steam were pumped in, the steam would condense on the chips.
4) The quality or usefulness of the paper or paperboard would suffer without web modification.
5) Provided printed papers were reclaimed for reuse in the manufacture of white paper, the ink would be removed by some cleaning operation.
6) If mechanical problems occurred, storage would maintain the supply of stock.

6. Прочитайте и переведите текст.

Continuous pulping (1)

The continuous digester accomplishes the same cooking and breakdown of the chips into individual fibers as was accomplished in the batch-type digester. The obvious difference is in the continuous nature of the operation. The continuous digester must be fitted with some mechanism to allow the continuous introduction of chips and removal of cooked chips from the bottom of the digester. The operation becomes more complicated because the continuous digester has been modified to allow washing the chips while still in digester.

The chips are brought to the digester area chip storage through the screening operation. Screening and maintenance of chip moisture must be performed for continuous digester operations the same as for batch digester operation. The need to control the cooking time and temperature is the same for continuous operation as for batch operation. The time in the digester is controlled by the flow rate of chips in the digester. At the point where the chips leave the chip bin they are put under a low to medium pressure by using steam to blow the chips

from a low-pressure meter into the presteaming vessel. The presteaming vessel performs just that function – the chips are presteamed in this tank. The size of this tank again is determined by the flow rate of chips and how long it is desired to have the chips in contact with the steam. At the exit end of the presteaming vessel there is a high-pressure valve. The chips are carried into the pocket in the high-pressure valve by the steam and condensate that are presenting the presteaming vessel. As the valve rotates, the pocket (at this time filled with chips) passes across an opening where liquor is pumped in. The liquor pushes the chips out of the pocket and carries them on towards the digester. Then the chips are forced out and carried up to the chip separator at the top of the digester. The separator separates the chips from the liquor. The liquor being used at this stage is full-strength cooking liquor.

7. Ответьте на вопросы.

1) What is the characteristic feature of the continuous digester?
2) How are the chips brought to the continuous digester?
3) How are the cooking time and temperature controlled in the digester?
4) What is the function of the presteaming vessel?
5) Where is the cooking liquor pumped into the chips?
6) Where are the chips separated from the liquor?

8. Заполните пропуски инфинитивом глаголов и переведите предложения.

1) The continuous digester is fitted with some mechanism ... the continuous introduction of chips.
2) The chips are pressed ... them into the presteaming vessel.
3) ... the chips in contact with the steam is important.
4) The liquor ... is full strength cooking liquor.
(to be used, to control, to allow, to have).

9. Переведите текст письменно со словарем.

As the chips are fully cooked they can be washed in the same digester by the introduction of washwater through the inside pulp or through strainer plates in the bottom of the digester. Enough water is introduced at the bottom of the digester to force the water up through the chips and out of the spent liquor strainers mentioned previously. It is possible to use hot water in these washers to maintain the temperature and pressure that was used in the cooking time. It is also possible to use cooler water to reduce the temperature of the chips as they settle toward the bottom of the digester. It is therefore possible to operate a continuous digester such that chips enter the top of the digester at temperatures greater than 100 C, then, by removing liquor to the heaters and pumping the hot liquor back into the digester, the temperature may be raised to about 160 C, where it is held through the cooking zone.

Урок 16

1. Выпишите из словаря следующие слова с транскрипцией и переводом. Запомните их произношение и значение.

pile (n.), extend (v.), removal (n.), introduction (n.), settle (v.), make up (v.), add (v.), penetrate (v.), depend (v.), ring strainer (n.), replacement (n.), remain (v.), edge (n.).

2. Переведите ряды слов, обращая внимание на значение словообразовательных элементов.

make (v.) – making (n.) – made (a.), make up (v.)
penetrate)v.) – penetrating (a.) – penetration (n.)
depend (v.) – dependence (n.) – independent (a.)
place (v.) – place (n.) – replace (v.) – replacement (n.)
extend (v.) – extension (n.) – extensively (adv.)
introduce (v.) – introducing (a.), introduced (a.) – introduction (n.)
move (v.) – remove (v.) – removal (n.).

3. Переведите словосочетания.

chip separator, liquor pump, ring strainer zone, heat exchanger, make up stock, screening operation, worldmarket demand, liquor replacement.

4. Переведите предложения, учитывая значение слова as 1) (cj.) – когда, так как; 2) (adv.) – как, as to – относительно

1) A paper property that affects the value of the paper as communication medium is its opacity.
2) There is no industry standard as to which side of the paper is always the smoothest or which way the sheet will curl.
3) As the thickness of the pad increases, the vacuum must be increased.
4) As the cooking liquor penetrates the chips, they react with the lignin and cellulose.
5) As the worldmarket demand for paper expands and as the demand for wood grows, alternative fiber sources become more important.
6) As the less industrialized nations become more developed, the demand for paper grows.

5. Переведите предложения, учитывая значение слова once (adv.) – 1) когда-то, иногда; 2) служит для усиления союзов if – если, when – когда.

1) Once the chips are into the digester, they form a large pile of chips extending from the bottom to the top.
2) All the operations the beater once performed still must be carried out by its replacement.
3) Once the material to be dried has been raised to the maximum temperature, the limiting factors in the rate of evaporation begin to function.

6. Переведите предложения, учитывая значение глаголов "should", "would" (см. Приложение II, табл. 10, 11).

1) If too much downward flow were allowed, enough stock would not be drawn out of the top.
2) If superheated steam were used, it would first be cooled to the condensation temperature.
3) Saturated steam should be used so that the latent heat of vaporization of water can be obtained and used to heat the web.
4) Fibers have a strong tendency to clump together and would make very lumpy paper if they were not diluted to below 1% consistency.
5) The cellulose is highly hydroscopic. Therefore the paper should be made with moisture content in equilibrium with the conditions where it is used.
6) If at this point in their treatment chemical pulp fibers were formed into a pad on a screen, the dried pad of fibers would be bond together well.

7. Прочитайте и переведите текст.

Continuous pulping (2)

Once the chips are into the digester, they form a large pile of chips extending from the bottom to the top. If the rate of introduction is equal to the rate of removal, then we have a static amount of chips in the digester and the pile will remain the same size. It is slowly settling toward the bottom of the digester. At the same time we are pumping the pulping liquor through the chips. The liquor is pumped in through a collection of pipes coming down the center of the digester.

The make up liquor will be added at the top of the digester to compensate for the liquor that is removed by the chip separator and returned to the liquor pump. As the chips settle through the digester, the liquor begins to penetrate them. The rate of reaction between the cooking liquor and the chips depends upon the temperature.

The cooking zone follows the first ring strainer zone, where the liquor is pumped out through the heat exchanger to increase its temperature and then pumped back into the digester. This kind of liquid replacement is used very extensively in continuous digesters.

The chips, as you remember, are not removed with the liquor, but remain in the digester, settling slowly towards the bottom. The hot liquor being pumped in forces the cooled liquor towards the outside edge where it is removed to the ring strainer located around the outside edge of the digester. The hot chips and liquor then settle slowly through the cooking zone and any other liquor is not pumped in or out.

8. Ответьте на вопросы.

1) What does the static amount of chips in the digester depend on?
2) How is the pulping liquor pumped through the chips in the digester?
3) What does the reaction between the cooking liquor and the chips depend on?
4) How is the liquid replacement carried out in the digester?
5) How is the cooled liquor removed?
6) What do the hot chips and liquor do in the cooking zone?

9. Замените пропуски глаголом, поставьте его в -ing форме. Предложения переведите.

1) In the digester the chips form a pile ... from the bottom to the top.
2) The liquor goes through a collection of pipes ... down the center of the digester.
3) The chips ... through the digester, the liquor begins to penetrate them.
4) The rate of reaction between the cooking liquor and the chips ... upon the temperature, it is necessary to keep it high and equal.
5) (depend, come, settle, extend).

10.С помощью данных суффиксов образуйте существительные от данных глаголов. Переведите их.

-tion:
to penetrate, to digest, to operate, to collect, to react;
-ing:
to pulp, to cook, to pump, to bleach, to recycle, to screen.

11.Переведите текст письменно со словарем.

Pulp from a continuous digester may already have been washed, but it still requires some form of screening operation, similar to that, used in the batch-type cooking process, to remove any oversize chips that were not completely digested or knots that may have been carried into the digester.

In order to supply the large tonnages (количество) that are required by the paper industry, continuous digesters can be very large machines. If the tonnage requirement of the mill is great enough, it becomes necessary to operate more than one digester. In the continuous digester it is possible to monitor the chips going in as well as the liquor being recirculated through the heater to check on how the process is proceeding.

Урок 17

1. Вспомните произношение и значение следующих слов.

yield (n.), differ (v.), efficiency (n.), weight (n.), remove (v.), recent (a.), groundwood (n.), require (v.), obtain (v.), waste liquor (n.), bark (n.), apply (v.), proceed (v.), include (v.), squeeze (v.), soften (v.), reduce (v.), bar (n.), raise (v.), clearance (n.).

2. Переведите ряды слов, учитывая значение словообразующих элементов.

proceed (v.), procedure (n.)
differ (v.), difference (n.), different (a.)
bark (n.), bark (v.), barker (n.), barking (n.)
soft (a.), soften (v.)
clear (a.), clearance (n.)
obtain (v.), obtaining (a.), obtained (a.)
apply (v.), application (n.).

3. Прочитайте и переведите словосочетания.

waste liquor, disc refiner, water extraction, fiber damage, energy cost,

high yield process, high yield pulp, groundwood process, stone groundwood.

4. Переведите предложения, обращая внимание на словосочетания with respect to - что касается, относительно, in terms of - с точки зрения.

1) The paper may have a very acid or corrosive nature with respect to some metals.
2) The basic theory of drying can be discussed in terms of a combination of drying rate, temperature and moisture content.
3) There must be a compromise to optimize the properties desired with respect to the materials available and the price that can be obtained for the finished product.
4) Formation indicates the overall uniformity of the sheet with respect to fiber distribution.

5. Переведите предложения, обращая внимание на -ing формы глагола.

1) The stock arrives at the conveyor belt consisting of synthetic woven material.
2) These dimensions of the chips are less easily controlled being dependent on different parameters.
3) The consistency of the stock being refined is very important when determining the relative amount of cutting.
4) Sodium hydroxide can cause discoloration of the fibers necessitating to restore the colour of the fiber.
5) Having installed fully controlled conditions of sheet formation and drainage in the press section the mill obtained uniform product quality.
6) Extracting water takes about an hour.
7) The first step in controlling effluent discharge is to reuse as much of white water as possible.

6. Прочитайте и переведите текст.

High-yield pulps (1)

Chemical and mechanical pulps differ not only in the properties of the pulp produced, but also in the yield of efficiency of the operation. The mechanical pulps produce a high yield of fibers based on the original weight of the wood, and the full chemical pulps remove more chemicals (lignin and hemicelluloses) and produce much lower yield. Although high-yield processes have been used for a long time, there has been extensive activity in this field in recent years, the reason was the energy cost. The groundwood process may produce a high yield pulp, but also requires a lot of energy. Full chemical pulping operations may operate on the energy obtained from burning waste liquor and bark and not require any outside energy.

High-yield processes are found in almost as many varieties as there are mills and there is considerable confusion in the names applied to these processes. The approach taken here will be to proceed from the most mechanical to the most chemical pulp.

The most mechanical, next to groundwood, is the operation sometimes called refiner groundwood or refiner mechanical pulp (RMP). The chips are simply squeezed to remove water and fed to a disc refiner. The chips will be partially crushed in the water extraction and completely broken into fibers in the refiner. This process can produce almost as much fiber damage, as the groundwood process, with little saving in energy.

By softening the chip with steam prior to refining or during refining, both damage to fibers and energy costs can be reduced. The first approach is called thermorefiner mechanical pulp (TRMP); the second, thermomechanical pulp (TMP). The quality of the pulp produced by those operations is similar, but not identical to that of stone groundwood.

7. Ответьте на вопросы.

1) What is the difference in efficiency of the operation between chemical and mechanical pulps?
2) Are there many varieties of high yield process in the paper industry?
3) What approach to enumerating the pulp process can be taken?
4) How is the refiner mechanical pulp produced?
5) How is the TRMP produced?

8. Заполните пропуски нужным словом. Переведите предложения.

1) ... of mechanical and chemical processes ... .
2) The original ... of the wood used in the mechanical process is high.
3) The chemical process ... much chemicals.
4) The energy obtained from burning ... and ... is used in chemical pulping.
5) One ... many names to high yield processes.

(applies, yield, waste liquor, differs, bark, weight, removes).

9. Переведите текст письменно со словарем.

Fibers that have been liberated during the process of pulping are not generally ready to be used to make papers. The exception is groundwood pulp, which is used in newsprint, and wastepaper, used in combination boxboard for packages. Groundwood fibers are mechanically treated by the grinder and secondary fibers were already refined for their original use. If at that point in their treatment chemical pulp fibers were formed into a pad on a screen, the dried pad of fibers would not bond together well and might even fall apart when attempts were made to remove it from the screen. The reasons for this behaviour are that the fibers are relatively stiff and don't have enough bonding groups on their surface to bond together into a strong sheet.

To better understand this behaviour and the treatment required to modify it, it is necessary to study the structure and nature of the fiber.

Урок 18

1. Выпишите из словаря следующие слова с транскрипцией и переводом. Запомните их произношение и значение.

lead (v.), soak (v.), pressurize (v.), replacement (n.), filler (n.), boxboard (n.), medium (n.), stiffness (n.), flute (v.), refiner (n.), treatment (n.), corrugated (a.).

2. Переведите ряды однокоренных слов, учитывая значение словообразующих элементов.

treat (v.), treated (a.), treatment (n.)
lead (v.), leading (a.), leader (n.)
add (v.), addition (n.), additive (a.)
find (found, found) (v.), finding (a.), found (a.)
place (v.), replace (v.), replacement (n.)
spend (v.), spent (a.).

3. Переведите словосочетания.

refiner chemical mechanical pulp, soak period, high yield pulp, short low-temperature cook, hard wood chips, secondary wastewater treatment plant.

4. Переведите предложения, учитывая значение слова function (n.) - функция, function (v.) - действовать, to be function of - зависеть от.

1) The two functions of a dryer can be satisfied by the use of a steam joint (паровой узел).
2) Different bleaching operations with sodium hydroxides, peroxides etc. are classified as oxidizing bleaches. But there are other bleaches which function in the opposite manner with reducing agents.
3) The dryers felt functions to hold the web tightly against the surface of the dryer.
4) The maximum strength of the sheet remains a function of the individual fiber strength and the number of fibers present in the sheet.
5) The ability of a sheet to hide the printing on the back side is a function of the sheet's ability to scatter light.

5. Переведите предложения, обращая внимание на подчеркнутые слова.

1) Since the penetration of water into the web causes a loss of strength, this fact is used as an evaluation for sizing.
2) The number of dryers needed is a direct function of the amount of water that must be evaporated.
3) There is a number of modifications of this machine.
4) Even in the case of the solid bleached board the thickness is often obtained by combining layers during the forming operation.
5) Fiber cutting will result in a certain amount of fiber shortening.
6) Because of diversity of grades it is not easy to describe the manufacturing process by grades.

6. Переведите предложения, обращая внимание на степени сравнения прилагательных и наречий (см. Приложение II, табл. 17).

1) Most tests subject the surface of the web to a liquid and measure the time required for it to soak.
2) Some paperboard grades are lighter and thinner than certain of the paper grades.
3) The higher the moisture the higher the gloss.
4) The most important development of paper manufacture has been the invention of papermaking machines around 1800.
5) High yield pulp is not as strong as kraft and as bright as groundwood pulp.
6) The finer the particles the better the gloss obtainable from the coating.
7) Most mills have extensive primary and secondary wastewater treatment plants.

7. Переведите предложения, обращая внимание на разные местоимения в функции словозаменителей.

1) The properties of these pulps are close to those of groundwood but are variable and dependent on actual process used.
2) Heavy materials or particles with a specific gravity greater than that of the fibers are removed with a centrifugal cleaner similar to the one shown in Figure 2.
3) The second most common treatment, but one that physically occurs before calendering, is surface sizing.
4) Raw materials used for the pulping are primarily wood fibers obtained directly from trees and those obtained from wastepapers.
5) There are many different processes suitable for secondary treatment, and a mill must choose the one most suited to its requirements.

8. Прочитайте и переведите текст.

High-yield pulp (2)

The next step in the movement, towards chemical pulps would be the use of chemical treatment in the process already described leading to the names chemithermomechanical pulp (CTMP) or refiner-chemical mechanical pulp (RCMP). The chemical treatment may be a soak period for the chips before or after the water extractor, or may be introduced after refiner. Many different processes are possible leading to the variety of names used for this group of processes.

The use of pressurized soak and perhaps even a continuous digester ahead of the refiner brings us to a family of processes known as semichemical pulps or just high-yield pulps. The most common of these is the neutral sulphite semichemical (NSSC) pulp. NSSC originally used a sulphite liquor neutralized to a pH of about 7 with waste liquor, a short low-temperature cook and mechanical treatment. The process still can be found, but it has also been modified in a number of applications to use all kinds of chemical liquors, temperatures and pressures.

Most of the high yield pulps are being used as replacements for

groundwood and are being used with little or no bleaching. Some of the TMPs are being used as a filler in boxboard, but only in one or two mills. The properties of these pulps are close to those of groundwood, but are necessary variable and dependent on the actual process used. The NSSC has been the pulp of choice for corrugating medium using primarily hardwood chips, spent liquor and lignin to give the paper its characteristic stiffness after it has been fluted (гофрировать) and is assembled into corrugated board.

9. Ответьте на вопросы.

1) What are the methods using chemical treatment of the pulps?
2) What processes use a pressurized soak and a continuous digester?
3) Where are most of the high yield pulps used?
4) Where are the TMP used?
5) Where are the NSSC used?

10. Заполните пропуски нужными причастными формами данных глаголов.

1) Many different processes ... to a variety of pulps are possible.
2) The use of pressurized soak brings as to a family of process ... as high yield pulps.
3) Most of the high yield pulps are ... as replacements for groundwood.
4) This process uses ... liquor and lignin to give stiffness to the paper.

(to know, to spend, to lead, to use).

11. Переведите текст письменно со словарем.

Fibers come in many sizes and shapes from different types of trees, but the predominant fibers used to develop strength in paper, technically called longitudinal tracheids, are from softwoods. Since these are the most important fibers for strength development, we will study them attentively.

It is well known that wood fibers are made of cellulose. It is known also that the cellulose is created as a result of photosynthetic activity in the tree leaves. But cellulose found in the fibers is not immediate product of photosynthesis. Cellulose is made in the individual cells from sugars generated by photosynthesis and transported to the cells or fibers by other fibers in the tree. The cellulose molecules are formed inside the fiber and are deposited on the inside of the cell wall by leaving material inside the cell.

Урок 19

1. Выпишите из словаря следующие слова с транскрипцией и переводом. Запомните их произношение и значение.

secondary fiber (n.), accomplish (v.), web (n.), coating (n.), complicate (v.), ink (n.), receive (v.), process (v.), defiber (v.), pulper (n.), content (n.), consistency (n.), rely on (v.), rubbing (n.), tear (tore, torn) (v.), fit (v.), soap (n.), foam (n.).

2. Переведите ряды однокоренных слов, учитывая значение словообразующих элементов.

fiber (n.), defiber (v.), defibering (n.)
complicate (v.), complicating (a.), complicated (a.)
rub (v.), rubbing (n.)
coat (v.), coating (n.), coater (n.)
separate (v.), separation (n.), separable (a.), inseparable (a.)
pulp (n.), pulp (v.), pulper (n.), pulping (n.)
ink (n.), deinking (n.).

3. Переведите словосочетания.
cellulose molecules, several cellulose chains, conveyor belt, solids content.

4. Переведите предложения, учитывая особенности перевода бессоюзных придаточных предложений (см. Приложение II, табл. 12).
1) The separation of the web into fibers is complicated by various chemical treatment and coatings the paper may receive in processing.
2) All the operations the beater once performed still must be carried out by its replacements.
3) The sheet of the machine is very important as is the effect the application system may have on the surface of the coating.
4) Were the coater to be installed on the machine, the unwind would be eliminated.
5) Should the starch fill some voids in the web, it could slow the penetration of water into the web.

5. Переведите предложения,, обращая внимание на степени сравнения прилагательных и наречий (см. Приложение II, табл. 17).
1) The most common mechanical pulp is groundwood.
2) Hardwoods give us fibers that help to fill in the sheet of paper making it smoother, more opaque and usually better for printing.
3) Wood fibers can be obtained in almost as many forms as there are types of trees.
4) The most common and oldest method of internal sizing is with rosin and alum.
5) The higher the consistency of the pulp in the paper the better.

6. Переведите предложения,, учитывая значение слова either (pron.) – любой; either ... or (cj.) – или ... или.
1) If the web with a high moisture content is pressed either too quickly or with too much pressure, the flow rate increases.
2) Either theory will suffice to explain the fiber shortening that occurs with low consistency refining..
3) If we want to increase the flow rate from the headbox, we can either increase the head in the box or make the slice smaller.
4) The kraft process is called also sulphite process. Either name is proper and both refer to the same pulping operation.
5) In either case the fibers must be separated first before any further treatment is carried out.
6) The pulper can be operated in either a batch or a continuous mode.

7. Прочитайте и переведите текст.

Pulping of secondary fibers

The pulping of secondary fibers, or wastepaper, is considerably more simple that the methods for pulping the wood. The main job to be accomplished in pulping wastepaper is simply separation of the web or sheet into its individual fibers. This is complicated by various chemical treatments and coatings the paper may have received in processing and, if the paper has been printed, the printing ink could cause difficulties. The removal of the ink is considered as a separate treatment called deinking. In either case, the fibers must be separated first before any further treatment can be carried out.

The most common device used to defiber secondary fibers is the pulper. This device is loaded with water and then with dry wastepaper, usually from a conveyor belt. Enough wastepaper is added to bring the solids content (called consistency) up to at least 5% to 6%. The higher the consistency the better because the machine relies on a certain amount of rubbing between the fibers or pieces of paper to do the job. The major part of the job of breaking the paper into fibers is accomplished by the rotor in the bottom of the pulper which tears the paper into small pieces. The rotor also must be designed to cause the pulp to move around the tank, so that all the charge flows past the rotor and may be broken down.

Once the bigger pieces have been broken down and the consistency increases, the rubbing together of the fibers helps break them down into individual fibers.

The pulper can be operated in either a batch or a continuous mode. For continuous operation the pulper must be fitted with a screen in the bottom. The holes of the screen will be still small enough to reject pieces of pulper and accept fibers. Some wastepapers are given either chemical treatment or coatings that will make it too difficult to break down. Simple heating of the water to about 65 C is common to help break down the wastepaper. Chemicals such as sodium hydroxide and/or soaps and dispersants can also be added.

8. Ответьте на вопросы.
1) What is the aim of the secondary fibers pulping?
2) What is deinking?
3) What is the pulper?
4) What does the rotor serve for?
5) How can the pulper be operated?
6) What is used in order to break down the wastepaper which has received chemical treatment?

9. Замените пропуски нужной глагольной формой.
1) The separation of the web ... in the pulper.
2) The rotor ... the paper into small pieces.
3) The separation of the web ... by various chemical treatments.
4) For continuous operation the pulper must ... with a screen in the bottom.

5) The operation of the machine ... on the process of rubbing between the fibers.
(relies, was accomplished, tears, be fitted, is complicated).

10. Подберите пары слов с противоположным значением из следующего ряда.

to reject, to form, to simplify, to break down, to accept, to complicate.

11. Переведите текст письменно со словарем.

Cellulose has a tendency to form a sort of crystalline structure, but because of the size of the cellulose molecules and the order chemicals present in the fiber, it is not easy for the cell to form large crystalline areas. We find instead that cellulose molecules pass through highly ordered or crystalline areas and then into random or amorphous areas. Several cellulose chains will be loosely organized together into threads or strands which can be found in the fiber in a variety of sizes. Within the smallest of these threads called a micelle strand we find several cellulose molecules which pass through regions of high and low order. Not all the molecules need to be included in all the ordered regions, and some of the molecules may even extend from one strand to another being part or perhaps several such strands. The micelle strands are organized into larger strands called fibrils.

Урок 20

1. Выпишите из словаря следующие слова с транскрипцией и переводом. Запомните их произношение и значение.

reuse (n.), cleaning (n.), adhere (v.), wash off (v.), flotation (n.), suitable (n.), washer (n.), obstacle (n.), collect (v.), sort (v.), contamination (n.), inclusion (n.), adhesive (n.).

2. Переведите ряды однокоренных слов, учитывая значение словообразовательных элементов.

use (v.), (n.), reuse (v.), (n.), user (n.), usable (a.), unusable (a.)
clean (v.), cleaning (n.), cleaner (n.)
wash (v.), wash off (v.), washing (n.), washer (n.), drum washer (n.)
sort (v.), (n.), sorting (n.)
contaminate (v.), contamination (n.)
adhere (v.), adhesive (a., n.).

3. Переведите словосочетания.

hydrogen bonding, polar water molecules, fiber parts, increased fiber flexibility flotation, deinking operation, drum washer, foam flotation techniques, low consistency stock suspension, pressure sensitive adhesives.

4. Переведите, обращая внимание на функцию инфинитива в предложении.

1) The deinking operation begins in the pulper with the selection of the chemicals to be added there.
2) Simple heating of the water is common to help break down the paper.

3) To ensure a continuous flow of pulp it is generally necessary for a mill to have several digesters.
4) Kraft pulp mills have learned to control the emission of unpleasant smelling sulphur compounds.
5) The stock is screened and cleaned to remove any dirt.
6) Each sort of papers requires a slightly different treatment to be used most effectively.

5. Переведите предложения, обращая внимание на функции -ing форм глагола.

1) Calcium carbonate can plug the pipes quickly requiring that the recovery operation be accelerated.
2) The plates allow water and dispersed ink to pass through while rejecting the fibers.
3) By rotating the rod in the direction opposite to the web travel the foreign particles causing scratches can be removed.
4) Two pistons of the grinding machine are used to push the logs against the surface of the revolving stone.
5) Presteaming can easily be accomplished in the digester by opening the steam valves leading to it and blowing live steam in among the chips.

6. Прочитайте и переведите текст.

Deinking operations

If printed paper is reclaimed for reuse in the manufacture of white paper, the ink must be removed by some form of cleaning operation. If the paper is coated and the ink is adhering only to the coating, the ink can simply be washed off the paper. In most cases, however, the process is not so simple. The deinking operation actually begins in the pulper with the selection of the chemicals to be added there. The chemicals will not only help to break up the paper but may also help to disperse the ink and remove it from the fiber. Most deinking operations use different types of washing equipment along with special chemicals to disperse the ink and make it easier to remove. The washers may be simple drum washers like those used in the chemical pulping and bleaching operations. More frequently the dilute stock passes over the inclined screen which allows water and dispersed ink to pass through while the fibers are concentrated on the surface. More recently foam flotation techniques have been adopted to deinking. Foam flotation process operates on low-consistency stock suspension while the ink is collected by the foam and removed from the fibers. Either process can operate effectively if the wastepaper used is suitable for deinking.

Not all paper can be deinked easily or economically. The largest obstacle to increased use of wastepaper is the cost of collecting and sorting it. Many forms of paper can be reused, but each requires a slightly different treatment to be used. Contamination of one useable type can cause considerable difficulty. The inclusion of some plastics of pressure-sensitive adhesives in wastepaper can make it practically unusable.

7. Ответьте на вопросы.

1) When must the ink be removed from the printed paper?
2) Where does the deinking operation begin?
3) What is the role of chemicals used in the cleaning operation?
4) What devices are used for washing during the deinking operations?
5) When are the foam flotation techniques used for deinking?
6) What are the difficulties of deinking process?

8. Переведите предложения, обращая внимание на подчеркнутые слова.

1) The water is drawn in both directions at the same time, since both directions should be hotter than the center of the web.
2) Calcium was originally preferred base because of its low cost and availability.
3) Photosynthetic activity in the tree leaves results into creation of the cellulose.
4) Bleaching has little effect on the strength of the resultant paper unless the pulp is bleached extensively.
5) All the waste paper that is made during start up and that results from any breaks can be reprocessed into paper.

9. Замените пропуски нужной глагольной формой.

1) The ink ... only to the coating.
2) All the chemicals ... .
3) The ink ... by the foam and ... from the fibers.
4) The waste paper ... .

(is to be sold, adheres, is collected, is removed, were removed).

10. Переведите текст письменно со словарем.

The sheet of paper is held together by hydrogen bonding. The strength of the hydrogen bond that forms between two hydroxyls is fixed and the only way is to increase the number of bonds between fibers. Because of the size and spatial problems it is important to develop mobility of the hydroxyls, or more specifically, of the fibrils in which the hydroxyls are located.

Water plays an essential role in bringing the hydroxyls together. The polar water molecule is attracted to the hydroxyls and, as it evaporates or is forced from the sheet, draws the fibrils (or fiber parts) together and aligns the hydroxyl groups for binding. However, unless the fiber has been treated properly, the hydroxyls cannot be moved as needed. The increased mobility comes from a combination of increased fiber flexibility allowing the fibers to collapse when dried and exposing of fibrils from the fiber surface.

Урок 21

1. Вспомните произношение и значение следующих слов. Проверьте ваши знания по словарю.

permanence (n.), perform (v.), confirmation (n.), purification (n.), cook (v.), impurities (n. pl.), sequence (n.), subject (n., v.), spent (a.), dissolved (a.), subsequent (a.), solution (n.), extraction (n.).

2. Переведите ряды однокоренных слов, учитывая значение словообразующих элементов.

pure (a.), purify (v.), purification (n.), impurities (n. pl.)
subsequent (a.), sequence (n.)
solution (n.), soluble (a.), dissolve (v.),
subject (v.), subject (n.)
continue (v.), continuation (n.), continuous (a.)
indicate (v.), indication (n.), indicator (n.)
cook (v.), cooking (n.), uncooked (a.).

3. Переведите словосочетания.

chlorination stage, high yield process, extraction stage, lignin molecules, water suspension, rotary drum washer.

4. Переведите предложения, учитывая значение слова "function".

1) The function of the headbox is to deliver a ribbon of stock to the wire at uniform dilution thickness and speed.
2) The dryer felt functions to hold the web tightly against the surface of the dryer to introduce heat transfer.
3) The function of the process in bringing the fibers together to promote bonding is of great importance.
4) The dryer functions to dry the web and to modify it.
5) The size of the holes of the wire is a function of the mesh size, the style of weave.
6) The ability of a sheet to hide the printing on the backside is a function of the sheet's ability to scatter the light.

5. Переведите предложения, обращая внимание на функции инфинитива и инфинитивных оборотов.

1) The digester is filled with the raw material to be cooked.
2) The polyuronic hemicelluloses appear to be completely removed by the reaction involved in the sulphite pulping process.
3) The unbleached sulphite pulp was found to be partially adapted to industrial papers.
4) In the alkaline processes a higher temperature has to be applied to bring about a separation of the lignin and cellulose.
5) If the pump is to be used in the manufacture of cellulose derivatives, further treatment is used to remove them.
6) The technique of paper manufacturing is reported to have been brought by a prisoner of war in Samarqand.
7) The organic acids make it necessary to have sufficient alkali present to neutralize partially these acids to prevent darkening of the wood due to acid hydrolysis.

6. Прочитайте и переведите текст.

Bleaching (1)

Both full chemical pulping operation and the high-yield processes leave the pulp too highly colored to be used in making paper. Unbleached groundwood and sulphite have been used and are being

used in newsprint, but the brightness of those papers is not really too high. Furthermore, due to the presence of lignin, these papers do not have any degree of permanence and yellow easily. Bleaching not only improves the whiteness of the pulp, it improves the permanence of that whiteness. Bleaching therefore performs two functions. The improvement in permanence is a result of the removal of lignin from the fibers. Therefore, bleaching can be seen as a continuation of the purification that begins in the pulping operations. If it is known that the pulp is to be bleached to a high brightness, it is common to use a strong pulping cook to deliver a purer pulp to the bleaching operation. The removal of impurities also indicates the need for washing as integral part of the total bleaching sequence. The pulp is normally subjected to washing after bleaching sequence to remove both the spent liquor and the impurities.

Bleaching operations primarily depend on chlorine and chlorine compounds. Depending on the conditions of use and the need of the pulp, chlorine is used in at least 3 different forms. Chlorine gas dissolved in water to a pH of about 2 is used as a common first stage of bleaching. The dissolved chlorine gas reacts with lignin remaining in the pulp and creates a lignin acid, which can be dissolved from the pulp in subsequent stages. The pulp will be washed following this chlorination stage and then sent to what is called an extraction stage. The extraction is accomplished by using a strong solution of sodium hydroxide, powerful enough to have a pH of about 12. The sodium hydroxide breaks down the lignin molecules and removes them from the fibers.

7. Ответьте на вопросы.

1) What kind of pulp is left after full chemical pulping operation?
2) What are the functions of bleaching?
3) What is an integral part of bleaching?
4) What chemicals are used for bleaching?
5) What chemical is used at the first stage of bleaching?
6) What treatment does the pulp have after the chlorination stage?
7) What treatment does the pulp have after washing?
8) What chemical is used for the extraction stage?

8. Переведите предложения, обращая внимание на подчеркнутые слова.

1) The major reason for bleaching is its effect on the whiteness of the paper.
2) Extensibility of the paper is important for bag and other packing papers for obvious reasons.
3) To dilute the same 2% stock to the 0, 5 consistency requires the addition of 150t. of water or a volume equal to 3 times the original.
4) The most common means for controlling the air in the dryer section is with dryer hood.
5) Because of great sensibility of paper to the reintroduction of water into the fiber it is important to treat the paper to improve its resistance to water.
6) Both full chemical operations and high-yield processes leave the pulp too highly colored to be used in making white paper.

7) Increasing the coat weight means increasing the possibility of disruption of the surface.

9. Заполните пропуски нужной глагольной формой.

1) Unbleached groundwood ... in newsprint.
2) Bleaching ... the whiteness of the pulp and the permanence f this whiteness.
3) The removal of impurities ... the need for washing.
4) Bleaching operations ... on chlorine compounds.
5) The dissolved chlorine gas ... with the lignin.
6) The pulp ... to an extraction stage.
7) The sodium hydroxide ... the lignin molecules.

(breaks down, indicates, reacts, is used, is sent, improves, depend).

10.Переведите текст письменно со словарем.

The equipment used for the bleaching operation consists primarily of closed tanks into which the pulp is pumped in water suspension after being mixed with the bleaching chemicals. The pulp is carried by water throughout most of the bleaching operations. The chlorination stage is usually carried out at fairly low consistencies and temperatures. A consistency of 3% to 4% will be quite fluid and will flow freely; therefore chlorination is usually done at about 3% consistency. The washing is carried out in rotary drum washers similar to the ones which are used in the washing that follows the pulping operations. The pulp coming off the drum washer will usually be about 6% consistency. Actually, there are pumps that can deliver 6% consistency pulp to the thickener where the consistency will be raised even higher. The extraction stage can be performed at consistency 6-12% by raising the consistency and then diluting it again by addition of the sodium hydroxide solution.

Урок 22

1. Вспомните произношение и значение следующих слов. Проверьте ваши знания по словарю.

common (a.), raise (v.), diminish (v.), bleach (v., n.), reach (v.), return (v., n.), justify (v.), provide (v.), become (v.), insert (v.), require (v.), remain (v.), brightness (n.), permanence (n.).

2. Переведите ряды однокоренных слов, учитывая значение словообразующих элементов.

observe (v.), observer (n.), observation (n.)
bright (a.), brightness (n.)
bleach (n., v.), bleaching (a.), bleached (a.), bleaching (n.)
wash (v.), washed (a.), washing (a.), washing (n.)
provide (v.), providing (a.), provided (a.), provision (n.)
finish (v.), final (a.)
treat (v.), treating (a.), treated (a.), treatment (n.).

3. Переведите словосочетания.

excess water, peroxide stage, bleach tower, multistage bleach sequence.

4. Переведите предложения, обращая внимание на местоимение it (см. Приложение 2, табл. 16).

1) Bleaching not only improves the whiteness of the pulp, it improves the permanence of that whiteness.
2) As the chips flow from the digester, it may be necessary to introduce steam to complete the blowing of the chips.
3) It is these short non-fibrous cells with content of tannin and related organic materials that are sources of the dark colour of the bark.
4) Most modern mills find it convenient to rebuild their machine without breaking off the production.
5) It is only recently that deinking with peroxide has been successfully carried out on a commercial basis.
6) It was the new engineer who could start up the production.
7) It is this versatility, availability that make paper so important to our civilization.
8) It was not until the early 1940's that a plant was in commercial operation in the US.

5. Переведите предложения, обращая внимание на глагол to follow – следовать за.

1) Each bleach is followed by a wash.
2) The pulp becomes yellow colored following the chlorination.
3) The peroxide stage of bleaching is followed by the chlorine dioxide stage.
4) Following dilution to below 1% consistency the stock is sent through screeners.
5) The wash following each bleach will raise the brightness to a fairly good level.

6. Переведите предложения, обращая внимание на слово both (pron.) - оба; both... and (conj.) - как... так и.

1) Paper has become an integral part of the development of our culture, both as communication medium and in packaging.
2) Many modern paper machines press the paper with felts on both sides.
3) Both full chemical pulping operations and the high yield processes leave the pulp too highly colored.
4) The web is heated from both sides alternatively.
5) Water and waste paper are added to maintain both the level of the stock in the tank and the consistency of the stock.

7. Прочитайте и переведите текст.

Bleaching (2)

It is hard for a casual observer do believe that chlorination and extraction are truly bleaching operations. The pulp will become yellow colored following the chlorination and brown colored following the extraction. Washing is necessary after extraction to remove the impurities, but the pulp will still require further bleaching to make it white. The remaining bleaching operations or stages are commonly oriented more toward removing color than impurities. Sodium

hypochlorite is the most common stage used following chlorination and extraction. Treating the pulp with one or two stages of hypochlorite bleaching and the wash following each bleach will raise the brightness to fairly good levels. However we reach a point of diminishing returns where further bleaching with hypochlorite will not improve the brightness enough to justify the cost. Peroxide bleach is therefore a common bleach stage used at this point. The peroxide has the advantage of providing better permanence and the pulp bleached with a final peroxide stage is less likely to yellow later. Another bleaching chemical that has become quite popular is chlorine dioxide. Chlorine dioxide can be used early in the bleaching sequence to help in purification or it can be used as a final bleach stage to give the pulp good permanence. It is common for highly bleached pulps to be subjected to several stages of bleaching. A common sequence for high brightness pulp would be: chlorination, extraction, hypochlorite, perhaps another hypochlorite and either peroxide or chlorine dioxide. Washing stages would be inserted between each bleach and at the end.

8. Ответьте на вопросы.

1) What colour is the pulp after chlorination and extraction stages?
2) What is the aim of washing and bleaching operations?
3) What chemicals are used for bleaching operations?

9. Переведите предложения, обращая внимание на степени сравнения (см. Приложение II, табл. 17).

1) The most popular wires are woven.
2) The softwood generally have longer fibers which contribute to the greater strength in the paper.
3) The largest obstacle in increased use of wastepaper is the cost of collecting and sorting it.
4) The surface of this paper is as smooth and uniform as is prescribed by the standard.
5) The more is the cost of the paper the better are its properties.

10.Заполните пропуски нужной глагольной формой.

1) The pulp ... brown colored following the extraction.
2) The impurities ... by washing.
3) The remaining bleaching operations ... toward removing color.
4) Each bleach ... the brightness to a good level.
5) The peroxide ... better permanence of the brightness.
6) Highly bleached pulps ... to several stages of bleaching.

(are subjected, becomes, are oriented, are removed, provides, raises).

11.Переведите текст письменно со словарем.

Subsequent bleaching stages are normally carried out at high consistencies. The higher consistency reduces the amount of dilution of the chemical, allowing less chemical to be used, and the further saves energy by eliminating the need to heat excess water. The peroxide stage is specially suited to high consistencies because the peroxide can still function well when released as a gas in the bleach tower. Not all pulps are bleached with multistage bleach sequences. Groundwood and

secondary fiber pulps frequently receive only a one-stage bleach of either hypochlorite or peroxide. Secondary fibers are generally pure enough not to need the purification possible with a combination of chlorination and extraction. Groundwood has too much lignin in it to be subjected to chlorination and extraction.

Урок 23

1. Вспомните произношение и значение следующих слов. Проверьте ваши знания по словарю.

remove (v.), raw material (n.), separate (v.), initial (a.), log (n.), wastepaper (n.), impact (n.), lead (v.), route (n.), pulping (n.), sawmill (n.), chipper (n.), grinder (n.), require (v.), groundwood (n.), treatment (n.), stock (n.), refiner (n.), strength (n.), furnish (n.), forming (n.), pressing (n.), drying (n.), include (v.), consolidation (n.).

2. Переведите ряды однокоренных слов, обращая внимание на значение словообразующих элементов.

form (v.), formation (n.), forming (a.), formed (a.), preforming (n.)
separate (v.), separate (a.), separation (n.), separator (n.)
operate (v.), operation (n.), unit operation (n.), suboperation (n.), operator (n.)
divide (v.), division (n.)
pulp (n., v.), pulping (n.), pulper (n.)
chip (n., v.), chipping (n.), chipper (n.)
grind (v.), grinding (n.), grinder (n.)
fine (a.), refine (v.), refining (n.), refiner (n.)
solid (a.), consolidation (n.)
ready (a.), ready (v.), readily (adv.).

3. Переведите словосочетания.

sequential unit operations, stock preparation, energy intensive industry, purchased energy consumption, fiber distribution, cross-machine direction, wire guide roll.

4. Переведите предложения, обращая внимание на причастные формы.

1) The sulphite process consists of the digestion of wood in an aqueous solution containing alkali-earth bisulphites.
2) Free lignosulphonic acid may be formed which causes a black cook resulting from the hydrolysis of cellulose.
3) The data obtained indicated that the physical properties of pulps manufactured from wood treated with liquors having a chemical ratio of 6 to 1 have optimum strength properties.
4) Both reactions proceed rather rapidly, the first leading to the formation of an equivalent quantity to hydrochloric acid.
5) The chlorine stage is followed by bleaching with sodium hypochlorite and finally with chlorine dioxide.
6) The coating operation may be performed on the paper machine, with the coater being an integral part of the machine.
7) The temperature increasing, the rate of evaporation increases.

5. Переведите предложения, обращая внимание на сложные союзы in order to - чтобы, with respect to - относительно, in terms of - с точки зрения.

1) Formation indicates the overall uniformity of the sheet with respect to fiber distribution.
2) The basic theory of drying can be discussed in terms of a combination of drying rate, temperature and moisture content.
3) As discussed with respect to machine direction, the increase of the thickness of the sheet will be greater in the cross-machine direction.
4) This roll is used in order to press down loose fibers, make the top surface a little flatter and possibly to put a watermark on the paper.
5) The felt is represented in terms of its contribution to the dewatering of the web.
6) The wire guide roll automatically corrects the movement of the wire in order to keep it properly positioned on the machine.

6. Прочитайте и переведите текст.

Summary (1)

Now let us summarize brief knowledge of the pulp and paper manufacturing we have received when studying this textbook.

All paper products are formed from fibers which must first be removed from the raw material being used and separated into individual fibers. The initial material may be anything from the logs to wastepaper. The nature of the raw material and the properties of the final product determine, which operation must be used to make each product. From this point to the end of the process every step will have an impact on the final properties of the product.

The industry can be divided into a series of sequential unit operations (этапы производства) that lead to the formation of the product. Within each operation there are several parallel routes that may be taken. For example, the first unit operation, the pulping, deals with liberation of fibers. The logs may go to the sawmill, the chipper or the grinder. Each will produce separated fibers, but the quality of the fibers from each one will be different. Different route require different degree of treatment. Groundwood pulp made by simply grinding logs my go directly to the paper machine, while chemical pulps generally require more treatment.

The second unit operation, stock preparation, further readies the fibers for their role in papermaking. Refiners modify the fibers physically and are the major factor in the development of strength in the paper. Blending of different fibers and the addition of chemicals (furnish) are also included in the area of stock preparation.

The third unit operation, the actual paper making, is divided into at least 3 suboperations: forming, pressing and drying. Different forms of machines are used to produce the different grades of paper. This unit operation includes preforming, forming, consolidation of the web and drying.

7. Ответьте на вопросы.

1) What material may be used for papermaking?
2) What is pulping?
3) What are the two methods of liberating fibers during the pulping?
4) What is the aim of stock preparation?
5) What devices are used to modify the fibers?
6) What operations ready the fibers for their role in papermaking?
7) What processes take place during papermaking?

8. Переведите предложения, обращая внимание на подчеркнутые слова.

1) Once the web has been warmed, the temperature may go as high as 200 C.
2) It is desirable to have some means of removing condensate created during the presteaming phase from the digester.
3) In order to warm the web and prevent localized overheating of the web, the temperatures of the first dryer are usually around 65 C.
4) While comparatively young trees may have smooth and thin bark, that of old trees is typically thick.
5) Because of large number of dryer cans the arrangement of the web is sometimes vertical.

9. Замените пропуски нужной глагольной формой.

1) The fibers ... from the raw material.
2) The industry ... into a series of sequential unit operations.
3) One may ... different routes within each operation.
4) Chemical pulps ... much treatment.
5) Refiners ... the fibers physically.
6) Blending ... in the area of stock preparation.

(modify, are removed, take, is included, is divided, require).

10. Переведите текст письменно со словарем.

The pulp and paper industry is highly energy intensive, it is the third in the USA after primary metals and chemicals in purchased energy consumption. It accounts for about 3% of total US energy consumption. An average of 30 million Btu's are required to manufacture a ton pulp and paper, about 40% is required in the chipping and pulping operations, another 40% in drying, finishing and the remaining 20% in bleaching, washing and refining.

The industry is unique in that a significant portion of the total energy required is self generated from fuels such as spent pulping liquors and woodwaste. As a result it uses less fossil fuels and other forms of purchased energy. In the early 1970's the industry purchased approximately 60% of its energy from sources outside the mill. By 1980 this share of power from outside sources had been reduced to about 50%.

Урок 24

1. Вспомните произношение и значение следующих слов. Проверьте ваши знания по словарю.

treat (v.), common (a.), improve (v.), surface (n.), perform (v.), conjugation (n.), excess (n.), shipping (n.), find (found, found) (v.), frequently (adv.), exception (n.), coating (n.), tissue (n.), folding boxboard (n.), converting (n.).

2. Переведите ряды однокоренных слов, учитывая значение словообразующих элементов.

perform (v.), performance (n.)
treat (v.), treatment (n.)
ship (n., v.), shipping (n.)
coat (v.), coating (n.), coater (n.)
convert (v.), converting (n.)
determine (v.), determining (n.), determined (a.)
change (n.), change (v.), changing (a.), changed (a.)
blend (v.), blending (n.).

3. Переведите словосочетания.

actual paper or paperboard manufacturing, separate unit operation, excess pulp, final pulp uniformity.

4. Переведите предложения, учитывая особенности перевода словозаменителей (см. Приложение II, табл. 14, 15).

1) The press section serves a second function besides the removal of water, that of consolidation of the web.
2) Cutting may not always be the most desirable form of the fiber treatment, but it is the one most directly observed in the paper treatment.
3) The amount of heat energy from cooling the steam is very small compared with that obtained from the condensation of the steam.
4) The pressure that develops in the digester may become greater than that which would be associated with the temperature due only to the steam pressure.
5) Since the paper must be dried in one pass around the dryer it is necessary to supply additional energy above that provided by the dryer can.

5. Переведите предложения, учитывая значение модальных глаголов (см. Приложение II, табл. 4).

1) In some regions of the world where the winters are severe the mill must be able to stockpile several months worth of wood.
2) Saturated steam should be used so that the latent heat of vaporization of water can be obtained and used to heat the web.
3) If the grade of paper being made on the paper machine is to be changed, the mixture of stock being prepared must be changed first.
4) It should be noted that about 60% of the bleached pulp made in Northern America is used on-site to make paper and paperboard.

5) If the wood is to be used for lumber, it is desirable to leave the tree whole.
6) The surface of application system should be made as smooth and uniform as possible.
7) The diameter of the wood has to be kept above a certain minimum.
8) As much as 90% of the pollutants have to be removed from the waste water of the papermaking process before discharging.

6. Прочитайте и переведите текст.

Summary (2)

The fourth set of operations, web modification, is generally found or performed on the paper machine, but is easier to treat as a separate unit operation. Some machines may include none of these modification operations while others may have several. The most common of these operations improve the paper for printing by making the surface smoother and more resistant to water or ink. This unit operation includes surface modification and physical modification of the paper web.

It is common for some of the operations to be performed by separate manufacturing units or even by different companies. Some plants exist primarily to produce pulp performing only selection of raw materials and liberation of fibers. However, most pulping operations are operated in conjunction with a papermaking operation. The pulp plant may also produce excess pulp which it sells to paper mills some distance from the forests. It is necessary for the pulp mill to be near the trees, but the paper mills need only to be near water and shipping.

The second and third unit operations (stock preparation and papermaking) are almost always found together since papermaking requires blending and, in most cases, refining. The web modifications are frequently found on the paper machine. One notable exception is pigmented coating which can be performed at a separate site.

The final group of operations, converting operations, is most likely to be separated from the papermaking operation, with the exception of tissue and folding boxboard for packaging grades. The location of the converting operation is determined by the relative costs of shipping raw materials and finished products, the speed with which products must be produced or changed and many other economic factors.

7. Ответьте на вопросы.
1) Where is the web modification performed?
2) What is the aim of web modification?
3) How are different operations of papermaking performed?
4) Where is the converting operation performed?

8. Переведите предложения, обращая внимание на подчеркнутые слова.
1) In order to supply large tonnage of pulp continuous digesters are very big.
2) Some of the problems of maintaining a low moisture content in the felt are due to the speed of the machine.

3) Due to the presence of lignin the papers do not have any degree of permanence and yellow easily.
4) Because of their smooth texture felt pieces were used to produce handmade paper.
5) In this case the only solution is to use another fiber collection for making this degree of paper.
6) The temperature of the web will not rise above the evaporation temperature of the water as long as there is water in the web.

9. Переведите предложения, обращая внимание на глагольные конструкции.
1) A paper that is more or less resistant to the penetration of liquids is said to be sized.
2) Sodium bicarbonate has been found to be the most desirable alkali to employ for this purpose.
3) The nylon is used in blends with cellulosic fibers, the latter serving the dual purpose of making the paper cheaper and imparting strength to the wet web.
4) In spite of the fact that pulp has been made over 75 years, its chemical reactions are still not definitely understood, although numerous theories have been proposed.
5) The fiber will stand the action of reasonable bleaching without being impaired.
6) These conditions are favourable for acid hydrolysis with the result that the less resistant polysaccharides are hydrolysed to simpler compounds, a portion being completely degraded.

10.Переведите текст письменно со словарем.

A typical mill produces 1000 tons/day of product although the capacity of mills can vary from 50 to over 3000 tons. Each of the operations involving wood chips or fiber is essentially hydraulic in nature and involves a sequential application of chemical, dilution water, mechanical energy or thermal energy. Sometimes this is followed by a reaction vessel with long residence time (время обработки). As a result, the last hydraulic dynamics are very important in determining the final pulp or paper uniformity. A typical mill is operated some 333 days per year, 24 hours per day, by a staff of a few hundred people.

ПРИЛОЖЕНИЯ

Приложение I

Коррективный фонетико-орфоэпический курс

I. 1. Чтение согласных букв

1. Прочитайте слова, учитывая особенности чтения буквы "g".

1) g [dʒ] перед e, i, y

engine, damage, vegetation, sludge, agent, hydrogen ;

2) g [g] перед a, o, u, согласными

gomme, investigate, groundwood, regard, regulation, significant,

HO: gear [gɪə];

3) Прочитайте слова с буквосочетанием "ng". Обратите внимание, что в конце слова "g" в этом буквосочетании не читается.

strong, dewatering, recycling, spreading, refining.

2. Прочитайте слова, учитывая особенность чтения буквы "c".

1) c [s] перед e, i, y

reduce, acid, cell, surface, consistency;

2) c [k] перед a, o, u, согласными

cut, carry, locate, continuous, lack;

3) ch [ʧ]

chip, discharge, bleach, change;

4) ck [k] в словах греческого происхождения

technology, chemistry, mechanical, characteristic;

5) ci [ʃ] в заударном слоге перед гласной

special, efficiency, commercial, appreciable.

3. Прочитайте слова, учитывая особенности чтения буквы "t".

1) ti [ʃ] в заударном слоге перед гласной

initial, ratio, potential;

2) -tion [ʃ(ə)n] (суффикс существительного) в заударном слоге

suction, application, combination, section.

4. Прочитайте слова, где звук [ʧ] выражается по-разному.

1) ch

chain, channel;

2) -ture

moisture, feature, saturated.

5. Прочитайте слова, где звук [ʃ] выражается по-разному.

1) sh

ash, flash, furnish;

2) ti в заударном слоге перед гласной

stationary, essentially, function;

3) ci перед гласной

ancient, especially, species;

4) -sion [ʃ(ə)n] после согласной

reversion, conversion, compression;

5) -sure [ʃə] после согласной

pressure.

6. Прочитайте слова, где звук [ʒ] выражается по-разному.

1) -sure [ʒə] после ударной гласной

measure, enclosure;

2) -sion [ʒ(ə)n] после ударной гласной

precision, corrosion, provision, conclusion;

3) s [ʒ] после ударной гласной перед -ual

usual, visual;

4) g [ʒ] в словах французского происхождения

regime, prestige.

7. Сравните произношение звуков

th [θ]	th [ð]
ethyl	further
growth	although
worthy	within

8. Прочитайте слова, в которых буква "s", как правило, читается между гласными [z] и между гласным и согласным и в начале слова [s]

result, to use, enterprise, desired

НО: есть слова, где s [s] и между гласными

increase, useful, case, base.

I. 2. Чтение гласных букв

Гласная буква	Без буквы "r" после гласной		С буквой "r" после гласной	
	закрытый слог	открытый слог	закрытый слог	открытый слог
a	man [æ]	name [eɪ]	car [a:]	care [ɛə]
o	not [ɔ]	note [əu]	nor [ɔ:]	more [ɔ:]
e	met [e]	mete [i:]	her [ə:]	here [ɪə]
u	but [ʌ]	mute [ju:]	burn [ə:]	cure [juə]
i/y	pin [ɪ] gyp [ɪ]	nine [aɪ] type [aɪ]	girl [[ə:] myrtle [ə:]	tire [aɪə] tyre [aɪə]

1. Прочитайте слова, учитывая разное чтение буквы "a" в зависимости от типа слога.

1) закрытый слог: a [æ]

rag, stack, handle.

НО:

в некоторых словах под ударением a [æ] и в открытом слоге:

management, manufacture;

2) открытый слог: a [eɪ]

rate, basic, grade;

3) закрытый слог с последующей буквой "r": a + r [a:]

bark, dark, compartment;

4) открытый слог с последующей буквой "r": a + r [ɛə]

area, prepare, various.

2. Прочитайте слова, учитывая разное чтение буквы "e" в зависимости от типа слога.

1) закрытый слог: set [e]

vessel, spend, territory;

2) открытый слог meter [i:]

equal, acetic, intermediate;

3) закрытый с последующей буквой "r": term [ə:]

service, detergent, fertile;

4) открытый с последующей буквой "r": sphere [ɪə]

material, interfere, inherent.

3. Прочитайте слова, учитывая разное чтение букв «i/y» в зависимости от типа слога.

1) закрытый слог: fit [ɪ]

timber, mix, print;

2) открытый слог: drive [aɪ]

hydroelectric, fiber, arise, piping;

3) закрытый слог с последующей буквой "r": birch [ə:]

fir, circulation, dirt;

4) открытый слог с последующей буквой "r": require [aɪə]

desirable, prior;

4. **Прочитайте слова, учитывая разное чтение буквы "o" в зависимости от типа слога.**

1) закрытый слог: cost [ɔ]

softwood, log, bottom;

2) открытый слог: stone [əu]

process, zone, soda.

НО: o [ʌ] в конце слова перед m, n, v, w, th

3) ton, cover, become.

НО: o [u:] после r, l, m

removal, improve;

4) закрытый слог с последующей буквой "r": form [ɔ:]

shortage, sort, force;

5) открытый слог с последующей буквой "r": core [ɔ:]

store, therefore, storage.

5. **Прочитайте слова, учитывая разное чтение буквы "u" в зависимости от типа слога.**

1) закрытый слог: cut [ʌ]

pulp, drum, pump;

2) открытый слог: cubic [ju:]

value, reduce;

3) закрытый слог с последующей буквой "r": curve [ə:]

occur, further, burn, furnish;

4) открытый слог с последующей буквой "r": pure [[juə]

during, impurity, purify.

НО: u [u:] в не которых словах

include, solution, pollution.

I. 3. Чтение буквосочетаний двух гласных

Первая	Вторая гласная буква				
	a	o	e	u/w	i/y
a				pause [ɔ] law [ɔ]	main [eɪ] pair [ɛə]
o	road [əu] roar [ɔ:]	book [u] pool [u:] poor [uə]	toe [əu] goes [əu]	loud [au] sour [auə] show [əu] town [au]	voice [ɔɪ] joy [ɔɪ]
e	teach [i] hear [ɪə]		meet [i:] cheer [ɪə]	few [ju:] crew [u:]	vein [eɪ] grey [eɪ]
u			due [ju:] blue [u:]		suit [ju:] fruit [u:]
i			pie [aɪ] ties [aɪ]		

1) **Прочитайте слова, учитывая особенности чтения под ударением сочетания буквы "a" с другими гласными: way [eɪ] ; law [ɔ:].**

straight, contain, chain; raw, cause, straw,

al + согласная [ɔ:]

salt, wall, false.

НО: [æ]

alcohol, alkali, calcium, valve.

2) **Прочитайте слова, учитывая особенности чтения под ударением сочетания буквы "o" с другими гласными.**

1) goal [əu]

float, coated, foam;

2) oil [ɔɪ]

noise, soil, joint, alloy, boiler;

3) wood [u]

cook, look, book;

4) choose [u:]

smooth, root;

5) crown [au]

account, ground, powerful;

6) owing to [əu]

grow, slow, flow,

7) double [ʌ]

couple, touch.

3) **Прочитайте слова, учитывая особенности чтения под ударением сочетания буквы "e" с другими гласными.**

1) bleach [i:] не перед d, th

reach, leaf, steam;

2) head [e] перед d, th, lth

health, spread, heavy;

3) speed [i:]

screen, degree, feed, need;

4) new [ju:]

renewable, sewage,

НО: ew [u:]

drew, flew;

5) appear [ɪə]

adhear, shear;

6) research [ə:]

early.

I. 4. Ударение

1) Прочитайте двусложные слова, в которых ударение, как правило, падает на первый слог.

acid, barker, cotton, feature, level, lignin.

2) Прочитайте двусложные глаголы, начинающиеся с префиксов, в которых ударение падает на второй слог.

adjust, affect, discharge, direct, explode, impinge.

3) Прочитайте слова французского происхождения, в которых ударение падает на конечный слог.

machine, regime, technique, canal, tracheid.

4) Прочитайте многосложные слова, учитывая, что, как правило, ударение в них падает на третий слог от конца.

consistency, alkaline, cellulose, derivative, efficiency.

5) Прочитайте трехсложные слова с суффиксами -ate, -ize, в которых ударение падает на третий слог от конца.

isolate, regulate, operate, neutralize, utilize.

6) Прочитайте многосложные слова, в которых, помимо ударения на третьем слоге от конца, есть второстепенное ударение.

a,vaila'bility, ,epi'thelial, ,solu'bility.

7) Прочитайте производные слова, в которых, как правило, сохраняется ударение исходного слова.

equal – equalize, vapour – evaporation, perforate – perforated, accumulate – accumulator, operate – operator.

8) Прочитайте слова-омонимы с разными ударениями: в существительном – на первом слоге, в глаголе – на втором.

the 'process – to pro'cess
the 'compound – to com'pound
the 'conduct – to con'duct.

Грамматические таблицы

Таблица 1

Глагол ***"to be"***

Функция в предложении и значение	Примеры	Перевод
1. Смысловой глагол «быть», «являться», «находиться».	Of all the natural components of carbon cellulose is the most abundant.	Из всех природных соединений углерода целлюлоза – самое распространенное.
2. Вспомогательный глагол для образования группы времен Continuous и пассивного залога.	The manufactures are using a new process. These reagents are used to determine the viscosity of cellulose solutions.	Производители используют новый процесс. Эти реагенты используются для определения вязкости растворов целлюлозы.
3. Модальный глагол (в сочетании с инфинитивом с "to") должен, обязан	The cooking liquor is to be added to the chips in the digester.	Варочную жидкость надо добавлять в щепу в варочном котле.
4. В конструкции there is (are, was, were) существует, имеется, есть	There are three chemical pulping processes: the soda, sulphate and sulphite.	Существуют три химических способа превращения в полумассу: натронный, сульфатный и сульфитный.

Таблица 2

Глагол ***"to have"***

Функция в предложении и значение	Примеры	Перевод
1. Смысловой глагол «иметь».	The final cooked pulp has good tearing strength.	Полученная сваренная масса имеет хорошее сопротивление раздиранию.
2. Вспомогательный глагол для образования группы времен Perfect. Самостоятельно не переводится.	Recently the mill has used a new model of digester.	Недавно завод использовал новую модель варочного котла.
3. Модальный глагол (в сочетании с инфинитивом с "to") должен, обязан.	This operation has to modify the paper.	Эта операция должна модифицировать бумагу.

Таблица 3

Страдательный (пассивный) залог (to be + Participle II)

Способ перевода	Примеры	Перевод
1	2	3
1. Сочетание глагола «быть» с кратким страдательным причастием прошедшего времени с суффиксом –н-, -т-. Глагол «быть» в настоящем времени не переводится.	The pulp is cooked was cooked will be cooked has been cooked had been cooked	Масса сварена Была сварена будет сварена была сварена была сварена
2. Глаголом на –ся в соответствующем времени, лице и числе.	This process is used for making bleachable grades of Kraft pulps.	Этот процесс используется для белимых сортов массы Kraft.
3. Глаголом действительного залога в 3 лице множ. числа в неопределенно-личном предложении.	A new digester was put into practice yesterday.	Новый варочный котел запустили в эксплуатацию вчера.
4. Глаголы с относящимся к ним предлогом, которые переводятся также глаголом с предлогом to depend on – зависеть от to insist on – настаивать на to refer to – ссылаться на to rely on – опираться на to speak of (about) – говорить о to deal with – иметь дело с (рассматривать), переводятся глаголами в неопределенно-личной форме, причем предлог ставится перед английским подлежащим.	This new experiment is referred to everywhere.	На этот новый эксперимент ссылаются везде.

Окончание табл. 3

1	2	3
5. Глаголы без предлога, которые переводятся глаголом с предлогом to affect – влиять на to act – действовать на to answer – отвечать на to follow – следовать за to influence – влиять на, переводятся глаголами в действительном залоге, причем предлог ставится перед английским подлежащим.	This process is affected by the temperature. The progress of cooking can be followed by analysis of cooking liquor.	На этот процесс влияет температура. За варочным процессом может следовать анализ варочной жидкости.

Таблица 4

Модальные глаголы

Модальный глагол и его эквивалент	Значение	Времена		
		Present	Past	Future
must to have to	должен, надо, нужно	must work have (has) to work	had to work	shall (will) have to work
can to be able to	могу, умею	can work am (is, are) able to work	could work was (were) able to work	shall (will) be able to work
may to be allowed to	могу, можно, разрешено	may work am (is, are) allowed to work	might work was (were) allowed to work	shall (will) be allowed to work
to be to	должен, предстоит (обусловлено заранее намеченным планом)	am (is, are) to work	was (were) to work	
should (+ инфинитив без "to")	должен, следует, следовало бы (совет, рекомендация)	This machine should be handled carefully. С этой машиной следует обращаться осторожно.		
ought to	должен, следует (совет, моральный долг)	The result of this experiment ought to be checked. Результат этого эксперимента следует проверить.		

Таблица 5

Причастия

Вид причастия	Функции в предложении и перевод		
	часть сказуемого	определение	обстоятельство
1	2	3	4
1. Participle I Active Voice forming	During the reaction with the lignin the chemical was forming soluble compounds. Во время реакции с лигнином химикат создавал растворимые соединения. (Для образования группы времен Continuous. Самостоятельно не переводится.)	The chemicals forming soluble compounds are acid or alkaline. Химикаты, образующие растворимые соединения, это кислота и щелочь. (Причастия на –щий, -вший)	The chemical reacts with the lignin forming soluble compounds. Химикат реагирует с лигнином, образуя растворимые соединения. (Деепричастие на -а, -я)
2. Participle I Passive Voice being formed	Soluble compounds are being formed in the wood. Растворимые соединения образуются в древесине. (Для образования группы времен Continuous. Самостоятельно не переводятся.)	Soluble compounds being formed in the wood are removed by washing. Растворимые соединения, образующиеся (образуемые) в древесине, удаляются промывкой. (Причастие на –ющийся, -емый, -имый)	(While) Being formed in the wood soluble compounds were removed by washing. При образовании в древесине (Если они образовывались в древесине) растворимые соединения удалялись промывкой. (Придаточное предложение, обстоятельство, выраженное существительным с предлогом)

Продолжение табл. 5

1	2	3	4
3. Participle II Passive Voice removed	1) The washing has removed the soluble compounds. Промывка удалила растворимые соединения. (Для образования группы времен Perfect. Самостоятельно не переводится) 2) The soluble compounds are removed. Растворимые соединения удалены. (Для образования пассивного залога. Самостоятельно не переводится)	1) Soluble compounds of lignin removed by washing affect the strength of the pulp. Растворимые соединения лигнина, удаленные промывкой, влияют на прочность массы. 2) The problem discussed there yesterday is very important. Проблема, обсуждавшаяся вчера, очень важна. (Причастие на –мый, -ный, -тый, -вшийся)	If removed, soluble compounds of lignin will not affect the quality of the pulp. Если их удалить (При удалении), растворимые соединения лигнина не будут влиять на качество массы. (Придаточное обстоятельственное предложение, существительное с предлогом в функции обстоятельства)
4. Perfect Participle Active Voice having removed			Having removed soluble compounds of lignin we assured good quality of the pulp. Удалив растворимые соединения лигнина, мы обеспечили хорошее качество массы. (Деепричастие на –ив, -ав)

Окончаниение табл. 5

1.	2.	3.	4.
5. Perfect Participle Passive Voice having been removed			Having been removed soluble compounds of lignin could not affect the quality of the pulp. После того, как их удалить (После удаления), растворимые соединения лигнина не могли больше влиять на качество массы. (Придаточное обстоятельственное предложение, существительное с предлогом в роли обстоятельства)

Таблица 6

Независимый причастный оборот

Примеры	Перевод
1) The problem being difficult, they worked hard.	Так как задача была трудная, они работали много.
2) The experiment being carried out, he cannot leave the laboratory.	Если эксперимент идёт, он не может уйти из лаборатории.
3) With radioactivity discovered, great progress was made in physics.	Когда была открыта радиоактивность, большие успехи произошли в физике.
4) He read two articles on this subject, the latter being more interesting.	Он прочитал две статьи на эту тему, причем последняя была более интересной.

Таблица 7

Герундий

Функция в предложении	Примеры	Перевод
1. Подлежащее	Retaining as much of the hemicellulose as possible in the pulp is important.	Удержание (Удерживать) как можно больше гемицеллюлозы в массе важно. (существительное, инфинитив)
2. Часть сказуемого	The main task is removing the lignin of the wood.	Главная задача – удаление лигнина из древесины. (существительное, инфинитив)
3. Прямое дополнение	The production requires utilizing a new conveyor system.	Производство требует использовать новую конвейерную систему. (инфинитив, существительное)
4. Определение (обычно с предлогом of после существительного)	The possibility of influencing the quality of the pulp is studied carefully.	Возможность влияния на качество массы изучается тщательно. (инфинитив, существительное)
5. Обстоятельство (обычно с предлогами in- при, в то время как on (upon) – по, после before – перед by – творительный падеж instead of – вместо того чтобы for – для и т.д.)	The operator examined the paper machine without stopping it.	Оператор осмотрел бумажную машину, не останавливая её (без остановки). (деепричастие, существительное с предлогом)

Таблица 8

Инфинитив

Функция в предложении	Примеры	Перевод
1	2	3
1. Подлежащее	To create a new model of digester is our task.	Создать новою модель варочного котла – наша задача. (инфинитив, существительное)
2. Часть сказуемого а) после глагола-связки б) после модального глагола (должен)	Their task is to create a new model of digester. You have to improve the quality of this paper.	Их цель состоит в том, чтобы создать новую модель варочного котла. (инфинитив) Вы должны улучшить качество этой бумаги. (инфинитив)
3. Дополнение	The client prefers to buy a new grade of paper.	Клиент предпочитает купить новый сорт бумаги. (инфинитив)
4. Определение	a) They have the possibility to improve the quality of the pulp. b) The new refiner to be installed at our mill has just arrived. c) He was the first to begin this experiment.	a) Они имеют возможность улучшить качество массы. (инфинитив) b) Новый рафинер, который будет установлен (должен быть установлен) на нашем заводе, только что прибыл. (Придаточное определительное предложение со сказуемым, выражающим действие, которое будет или должно быть совершено) c) Он первый начал этот эксперимент.

Окончание табл. 8

1	2	3
5. Обстоятельство	The dry wood is pretreated at the mill with hot water <u>to make</u> barking easier.	Сухая древесина подвергается на заводе предварительной обработке горячей водой <u>для облегчения</u> окорки. (инфинитив с союзом «чтобы», существительное с предлогом «для»)

Таблица 9

Инфинитивные обороты I.
Сложное подлежащее

Примеры			Перевод	
1			2	
			Переводится двумя способами: 1. Дополнительным придаточным предложением с союзами «что», «чтобы», «как». Инфинитив переводится личной глагольной формой.	
<u>The paper machine</u>	is known is likely is certain is found is reported is assumed is considered is expected appears seems proved	<u>to work</u> very efficiently.	Известно Вероятно Несомненно Обнаружено Сообщают Допускается Считается Ожидается Оказывается Кажется Доказано	, что <u>бумагоделательная машина работает</u> очень эффективно.
			2. Простым предложением с вводным словом, соответствующим сказуемому английского предложения.	
The paper machine <u>is known</u> to work very efficiently.			Бумагоделательная машина, <u>как известно</u>, работает очень эффективно.	

Окончание табл. 9

II. Сложное дополнение

1	2
1) They want (like) the plan to be fulfilled. 2) * They see (hear) the engineer leave the room. 3) * They order, allow (let), cause, force (make) these rolls to arrive immediately.	1) Они хотят, чтобы план был выполнен. 2) Они видят (слышат), что инженер уходит из комнаты. 3) Они приказывают (позволяют, заставляют), чтобы эти валы прибыли немедленно.
* После глаголов чувственного восприятия (see, hear, feel и т. д.), а также глаголов let, make, have используется инфинитив без частицы "to".	Переводится придаточным предложением с союзами «что», «чтобы», «как». Инфинитив переводится личной глагольной формой.

Таблица 10

Глагол "should"

Функция в предложении и значение	Примеры	Перевод
1. Вспомогательный глагол: 1) для образования времен Future in the Past 1 л. ед. и мн. числа; 2) в сложноподчиненном предложении с условным придаточным с 1 л. ед. и мн. числа; 3) в условных придаточных, действие которых не вполне реально и относится к будущему (со всеми лицами); 4) в бессоюзных условных придаточных предложениях (со всеми лицами); 5) в придаточных предложениях после безличных оборотов типа "it is necessary".	1) We decided that we should finish the work in time. 2) If (provided, in case, unless) the task were difficult, I should help you. 3) If he should see her tomorrow, he would give her the book. 4) Should the machine be equipped with new rolls, its efficiency would be greater. 5) It is important that the machine should be equipped with a new screener.	1) Мы решили, что кончим работу вовремя (глагол в будущем времени). 2) Если бы (в случае если, если не) задача была бы трудной, я помог бы вам (глагол в прошедшем времени с «бы»). 3) Если бы он увидел её завтра, он дал бы ей книгу (глагол в прошедшем времени с «бы»). 4) Если бы машина была оснащена новыми валами, её производительность была бы больше (глагол в прошедшем времени с «бы»). 5) Необходимо, чтобы эта машина была оборудована новой сортировкой (глагол в прошедшем времени).
2. Модальный глагол со значением долженствования	These experiments should be repeated.	Эти эксперименты следует (следовало бы, нужно) повторить.

Таблица 11

Глагол "would"

Функция в предложении и значение	Примеры	Перевод
1. Вспомогательный глагол: 1) для образования времен Future in the Past 2 и 3 л. ед. и мн. числа; 2) в сложноподчиненном предложении с условным придаточным с 2 и 3 л. ед. и мн. числа; 3) для образования сослагательного наклонения в простом предложении, когда условие подразумевается.	1) They said that they would come tomorrow. 2) If (provided, in case) the task were difficult, they would help you. 3) It is a pity he is busy. He would help you.	1) Они сказали, что придут завтра (глагол в будущем времени). 2) Если бы (в случае если) задача была бы трудной, они помогли бы вам (глагол в прошедшем времени с «бы»). 3) Жаль, что он занят. Он помог бы вам (глагол в прошедшем времени с «бы»).
2. Модальный глагол: 1) для выражения повторного действия в прошлом; 2) для выражения желания или нежелания совершить действие; 3) как форма вежливости.	1) He would not listen to their advice. 2) He tried to start up the machine, but it would not. 3) Would you kindly help me.	1) Он обычно (часто, бывало) не слушал их советов. 2) Он попытался запустить машину, но ничего не получалось (она «не хотела»). 3) Будьте любезны, помогите мне.

Таблица 12

Бессоюзные придаточные предложения

Вид предложения	Примеры	Перевод
1. Дополнительное придаточное предложение	That means you can start up the machine.	Это означает, что вы можете запускать машину.
2. Определительное придаточное предложение	The digester we install at our mill is manufactured by a well known group.	Варочный котел, который мы установили на нашем заводе, изготовлен хорошо известной фирмой.
3. Условное придаточное предложение с инверсией с глаголами were, had, could, should	Were the digesters installed, we could start up the new production line.	Если бы варочный котел был установлен, мы могли бы запускать новую производственную линию.

Таблица 13

Типы условных предложений

Реальные условия	Не вполне реальные условия	Нереальные условия
1) Союзные (с союзами if – если; provided (that), providing (that) – если, supposing (that) – если; on condition (that) – при условии что		
If he goes to bed early, he will get up early. Если он ляжет спать рано, то и встанет рано. Времена: после союза – Present Simple, в главном – Future Simple.	If he went to bed early in summer, he would get up early. Если бы он ложился спать рано летом, то и вставал бы рано. Времена: после союза – Past Simple, в главном – would, could, might + Infinitive	If he had gone to bed early yesterday, he would have got up early. Если бы он лег спать рано вчера, то и встал бы рано. Времена: после союза – Past Perfect, в главном – would, could, might + have + Participle II
2) Бессоюзные (с инверсией в начале предложения: had, were, could, should)		
	Could he swim well, he would take part in the competition. Если бы он хорошо плавал, то принял бы участие в соревновании.	

Таблица 14

Многофункциональное слово "one"

Функция, значение	Примеры		Перевод	
1. Числительное «один», «одна», «одно».	This mill is one of the oldest.		Этот завод - один из самых старых.	
2. Формальное подлежащее в неопределенно-личных предложениях. Самостоятельно не переводится	One knows One believes One can expect One must expect One may expect One should expect	that this mill gives good profits	Известно Считают Можно ожидать Нужно ожидать Можно ожидать Следует ожидать	, что этот завод дает хорошую прибыль.
3. Словозаменитель. Переводится тем существительным, которое заменяет или опускается в переводе.	The new way of transporting raw materials differs from the old one.		Новый способ перевозки сырья отличается от старого (способа).	
4. Местоимения в форме притяжательного падежа one's - свой, собственный.	It is difficult to predict one's behaviour during the recession.		Трудно предсказать свое поведение во время экономического спада.	

Таблица 15

Многофункциональное слово "that", "those"

Функция и значение	Примеры	Перевод
1. Указательное местоимение «тот», «те», «этот», «эти».	Those papers are manufactured at our mill.	Эти бумаги производятся на нашем заводе.
2. Словозаменители. Переводятся тем существительным, которое заменяют, или опускаются в переводе.	The purity of mechanical pulp is low compared with that of chemical pulp.	Чистота механической массы низкая по сравнению с химической массой.
3. Союзное слово – «который».	The machine that was installed at our mill is efficient.	Машина, которую установили на нашем заводе, эффективна.
4. Союз – «что», «чтобы».	One can say that this manufacturer is the most reliable.	Можно сказать, что этот производитель самый надежный.

Таблица 16

Многофункциональное слово "it"

Функция и значение	Примеры	Перевод
1. Личное местоимение «он», «она», «оно» (неодушевленный предмет).	A new method of modifying the pulp is worked out at our mill. It gives a pulp of better quality.	Новый метод модификации массы разработан на нашем заводе. Он дает массу лучшего качества.
2. Указательное местоимение – «это».	The temperature is rising slowly. It means that ...	Температура медленно поднимается. Это означает, что ...
3. Формальное подлежащее безличного предложения. Самостоятельно не переводится.	It is common practice It is essential It is impossible to use this method. It is important It is expected	Обычно принято Важно использовать этот Невозможно метод Важно (использование Ожидается этого метода)
4. Формальное дополнение после некоторых глаголов. Не переводится.	The method makes it possible to obtain good productivity.	Метод делает возможным получить хорошую производительность.
5. Часть выделительной конструкции "it is ... that (which)". Переводится «именно», «это», «только» и т.д.	It is in our laboratory that the new method was worked out. It was not until 1950 that the new technique entered into practice.	Именно в нашей лаборатории был разработан новый метод. Только в 1950 г. новый метод вошел в употребление.

Таблица 17

Степени сравнения прилагательных и наречий

Положительная степень	Сравнительная степень	Превосходная степень
Односложные и двусложные прилагательные на –er, -y, -ow		
long - длинный	longer - длиннее, более длинный	the longest - самый длинный, длиннейший
easy - легкий	easier - легче, более легкий	the easiest - самый легкий, легчайший
Многосложные прилагательные		
important - важный	more important – более важный, важнее	the most important – самый важный, важнейший
Исключения		
good - хороший	better - лучше	the best - наилучший, самый хороший
bad - плохой	worse - хуже	the worst - наихудший, самый плохой
little - маленький	less - меньше	the least - наименьший, самый маленький
many, much - много	more - больше	the most - больше всего
far - далеко	further - дальше, далее	the furthest - дальше всего

Союзы сравнения: as... as - так же..., как; такой же..., как

the higher... the better - чем выше..., тем лучше

Дополнительные тексты

Internal methods of modification

Sizing: Improving Water Resistance

Since paper is made with water as the carrier and as an aid to bonding, paper is extremely sensitive to the reintroduction of water into fiber network. Cellulose is very hydroscopic and will absorb water from the air. The water will cause the sheet to swell and perhaps curl. Therefore it is important to treat paper to improve its resistance to water. There are two major methods of obtaining water resistance: the addition of chemicals during web formation, called internal sizing, or surface application of chemicals after formation, called surface sizing.

The most common, and oldest, method of internal sizing is with rosin and alum. Rosin, a natural organic acid obtained from trees, is emulsified in water and added to the fibers before they are sent to the paper machine. The rosin is slightly anionic and will tend to stick to the fibers. After the rosin is mixed with the fibers alum is added to the stock. Alum is a water solution of aluminium sulfate, with some of the aluminium also in the form of aluminium hydroxide. The alum has enough extra acid to be at a low pH and will be added in sufficient quantity to lower the pH of the stock to about 4 to 5. The alum flocculates with the rosin and with itself creating flocks that adhere to the fibers. The rosin-alum flocks are water resistant after drying, and their presence helps the web resist water penetration. The degree of water resistance obtainable is variable based on the level of addition, pH and some other variables, but in any case is not enough to make the paper truly waterproof. Water will still penetrate into the web, but at a slower rate. Furthermore, the web can still be broken up by the combined action of water and mixing energy.

The alum remaining in the web is harmful to the permanence of the paper. If the paper is used in documents that must be kept for a long time, the rosin-alum sizing system can make the paper brittle. Early handmade paper that has lasted so long was probably sized with animal glue. Recent developments by chemical companies have given the papermaker several alternatives to acid sizing systems. We now can select from rosin-based systems that can perform at neutral or nearly neutral pH or other organic compounds that can be used without the addition of alum or any other acid.

Wet Strength and Bonding Additives

If it is necessary for the paper or paperboard to be wetted and still retain strength, a different type of additive called a wet strength agent must be used. The wet strength agent is added to the stock prior to formation of the web, the same as the sizing agent. The most common of the wet strength chemicals is melamine formaldehyde (MF). The MF will react during the drying of the paper to form a water-resistant compound. By adding the MF to the stock prior to web formation it can adhere to the fibers also be deposited on the bond areas during web formation. The MF then functions in the web to protect the bonding and also to hold the fibers together when the web is wetted. Wet strength

agents are important in paper toweling, wrapping or bag papers that may be wetted during use and paperboard that will be used in wet application.

Starch is also added to the stock before web formation to glue or bond the fibers together. Starch is chemically quite similar to cellulose and can bond to fibers to increase the degree of bonding on the web. The presence of the starch in the web may improve the water resistance a little; however, starch is less water resistant than cellulose and therefore will not improve wet strength very much. The penetration of water into the web is dependent on the pore structure of the web as well as on the contact angle of the liquid and the fiber surface. If the starch fills some of the voids in the web, it can slow the penetration of water either into or through the web. Other vegetable and animal gums, which may also contain proteins, have been used to help develop dry bonding, but starch remains the most common additive.

Optical Property Modification

Colored paper has traditionally been made by the addition of dyes or colored pigments to the fibers either prior to or during the formation operations. There are three classes of dyes commonly used with paper: acid, direct and basic. Basic dyes are quite strong and have affinity for unbleached fibers, which make them best in that application. Acid dyes work better with bleached stock, but are of lower strength. Direct dyes attach to the fibers and therefore seem to have a higher tinctorial strength. Any dye will be partially lost to the whitewater during web formation. The concentration of dye in the whitewater varies with the amount used as well as the type. Any dye in the whitewater is a problem to the mill since the dye can find its way into the mill effluent stream. Even if the whitewater is retained in the mill to be reused, the colored whitewater can be used only in that color paper and must be flashed (вымывать) from the system when changes to other colors are made. Making colored paper by the internal addition of dyes is extremely difficult to the mill and requires that the cost of such products be high enough to compensate for those difficulties. Many mills have developed methods for surface application of dyes to solve the pollution problem.

Mineral pigments, both white and colored, can also be added to the fibers prior to web formation to modify the optical properties of the web. Colored pigments can be used to color the paper or paperboard, but can also contribute to problems with contamination of the whitewater. White pigments are the most commonly used. White pigments will improve the brightness and opacity of the paper, but may reduce the strength since they replace some fibers in the web and interfere with bonding between the fibers. Cellulose fibers are essentially transparent to light and will form a clear film of cellophane when dissolved and redeposited in a film. Paper is visible and obtains its optical properties from many light-scattering surfaces in the web structure.

The most common pigment fillers are clay, calcium carbonate and titanium dioxide. The clay used is the kaolin crystalline form, which is mined in many places of the world. Clays are fairly bright and are the lowest cost filler. Calcium carbonates are quite a bit brighter, but cannot be used with acid sizing systems since the acid will decompose the carbonate, releasing carbon dioxide and causing foam. The carbonate still finds use with nonacid sizing systems and in cigarette papers where they help control ash development. Titanium dioxide is the least used, partially because it costs about 10 times as

much as clay, and also because it is so effective that little is needed. It is most effective at developing opacity in paper.

The level of substitution of filler for fiber can run from as low as 2% for titanium to as high as 30% for clay or carbonate. Beside their effect on brightness and opacity the fillers will also change the printing and handling properties of the web. The filled sheet will usually print better due to better formation smoothness and control of ink penetration into the web. Individual pigments or mixtures of pigments are used to maximize final sheet properties. There is, however, a limit to the amount of filler that can be used without harmful loss of strength, stiffness or other performance properties of the web.

Surface modification methods

Chemical Modification: Surface Sizing.

The web can be treated with starch or other gums at the size press to help improve water repellency. The mechanism of action is either to change the contact angle of the water with the paper surface or to plug or seal pores in the web surface. Starch is the most common surface sizing material. Since starch is not too water resistant itself, it is believed that it functions primarily by improving bonding at the surface, to plug the surface and retard penetration of water. Polyvinyl alcohol and animal gums are also used and are claimed to be more effective.

Surface sizing can also create a surface that will resist erasures or other forms of abrasion. Although the main mechanism is one of improved bonding, fluorocarbons silicones, waxes or other agents also prevent the ink from penetrating too far into the web making it easier to remove. Special chemicals are sometimes applied to develop resistance to oils, grease and other materials, but it is not easy to develop a high degree of resistance with a simple size press application.

СЛОВАРЬ

A		
above, adv., prep.	[ə'bʌv]	выше, над
abrasion, n	[ə'breɪʒ(ə)n]	истирание
absorb, v	[əb'sɔb]	поглощать, впитывать
accelerate, v	[ək'seləreɪt]	ускорять
acceptable, a	[ək'septəbl]	приемлемый
accomplish, v	[ə'kɔmplɪʃ]	выполнять
accomplishment, n	[ə'kɔmplɪʃmənt]	выполнение
accordingly, adv.	[ə'kɔ:dɪŋlɪ]	соответственно
account for, v	[ə'kaunt]	отвечать за что-л., объяснять что-л.
accumulate, v	[ə'kju:mjuleɪt	собрать
achieve, v	[ə'tʃi:v]	достигать
acid, n	['æsɪd]	кислота
action, n	['ækʃ(ə)n]	действие
activity, n	[æk'tɪvɪtɪ]	деятельность, активность
actual, a	['æktʃuəl]	действительный
actually, adv.	['æktʃuəlɪ]	действительно, фактически
adapt, v	[ə'dæpt]	приспосабливать
add, v	[æd]	прибавлять
addition, n	[ə'dɪʃ(ə)n]	добавление
additional, a	[ə'dɪʃənl]	дополнительный
additive, n	['ædɪtɪv]	добавка
adequate, a	['ædɪkwɪt]	соответствующий
adhere, v	[əd'hɪə]	прилипать
adhesive, a, n	[əd'hi:sɪv]	клеящий, клеящее вещество
adoption, n	[ə'dɔpʃ(ə)n]	принятие
advanced, a	[əd'va:nst]	передовой
advantage, n	[əd'va:ntɪdʒ]	преимущество
affect, v	[ə'fekt]	влиять
affinity, n	[ə'fɪnɪtɪ]	сродство
agriculture, n	['ægrɪkʌltʃə]	сельское хозяйство

ahead, adv.	[ə'hed]	впереди
aid, n, v	[eɪd]	помощник, помогать
aim, n	[eɪm]	цель
align, v	[ə'laɪn]	выравнивать
alkáli, n	['ælkəlaɪ]	щелочь
alkali-earth, a	['ælkəlaɪ ə:θ]	щелочно-земельный
alkaline, a	['ælkəlaɪn]	щелочной
allow, v	[ə'lau]	позволять
alloy, n	['ælɔɪ]	сплав
along with, prep.	[ə'lɔŋ wɪð]	наряду с
alter, v	['ɔltə]	изменять (ся)
alternate, a	[ɔl'tə:nətɪv]	запасной, дополнительный
alternatively, adv.	[æl'tə:nətɪvlɪ]	попеременно
although, adv.	[ɔl'ðəu]	хотя
alum, n	['æləm]	квасцы
ammonia, n	[ə'məunjə]	аммиак
among, prep.	[ə'mʌŋ]	среди
amount, n	[ə'máunt]	количество
angle, n	['æŋgl]	угол
animal, a, n	['ænɪm(ə)l]	животный, животное
annual, a	['ænjuəl]	годовой, годичный
apart, adv.	[ə'pa:t]	раздельно, отдельно
application, n	[ˌæplɪ'keɪʃ(ə)n]	применение, нанесение (слоя)
apply, v	[ə'plaɪ]	применять, накладывать
approach, v to take a.	[ə'prəutʃ]	подход подойти к, рассмотреть
approximately, adv.	[ə'prɔksɪmɪtlɪ]	приблизительно
aqueous, a	['eɪkwɪəs]	водный
area, n	['ɛərɪə]	площадь, область
around, prep., adv.	[ə'raund]	около, вокруг, кругом
arrange, v	[ə'reɪndʒ]	располагать
arrangement, n	[ə'reɪndʒmənt]	расположение
art, n	[a:t]	искусство

as, cj., adv. as long as as soon as as well as as to	[æz]	так как, когда, как пока как только так же, как относительно, что касается
ash, n	[æʃ]	зола
assemble, v	[ə'sembl]	собирать
associate, v	[ə'səuʃɪeɪt]	связывать
assume, v	[ə'sju:m]	предполагать, принимать
attach, v	[ə'tætʃ]	присоединяться
attempt, n	[ə'tempt]	попытка
availability, n	[əˌveɪlə'bɪlɪtɪ]	наличие
available, a	[ə'veɪləbl]	доступный
average, a, n	['æv(ə)rɪdʒ]	средний, средняя величина
	B	
bag, n	[bæg]	мешок
balance, n, v	['bæləns]	равновесие, весы уравновешивать
bar, n	[ba:]	нож
bark, n, v	[ba:k]	кора, окорять
barker, n drum b.	['ba:kə]	корообдирка корообдирочный барабан
base, n	[beɪs]	основание
basin, n	['beɪsn]	отстойник
basis, n	['beɪsɪs]	основание, основа
batch, n, a	[bætʃ]	партия, группа, периодический
beam, n	[bi:m]	луч
beat, v (beat, beaten)	[bI:t]	разбивать
beater, n	['bitə]	ролл
because, cj. because of, prep.	[bɪ'kɔz]	потому что из-за, вследствие
become, v	[bɪ'kʌm]	становиться
behaviour, n	[bɪ'heɪvjə]	поведение
behind, adv.	[bɪ'haɪnd]	позади
believe, v	[bɪ'li:v]	верить
below, adv., prep.	[bɪ'ləu]	ниже, под

belt, n	**[belt]**	(приводной) ремень
benefit, n	**['benɪfɪt]**	польза, прибыль
besides, prep.	**[bɪ'saɪdz]**	помимо
bin, n	**[bɪn]**	бункер
birch, n	**[bə:ʧ]**	береза
blast, n	**[bla:st]**	поток
bleach, v, n	**[bli:ʧ]**	отбеливать, отбелка
bleaching, n	**[bli:ʧɪŋ]**	отбелка
blend, v, n	**[blend]**	смешивать, смесь
blending, n	**['blendɪŋ]**	смешивание
blow, v (blew, blown)	**[bləu]**	вдувать
blowing, n	**['bləuɪŋ]**	вдувание
blowtank, n	**['bləu'tæŋk]**	бак для выдувки
blueness, n	**['blu:nɪs]**	голубизна
board, v construction b.	**[bɔ:d]**	картон строительный картон
boiler, n	**['bɔɪlə]**	котел
bond, v, n	**[bɔnd]**	связывать (ся), связь
bonding, n	**['bɔńdɪŋ]**	сцепление
both, pron. both...and conj.	**[bəuθ]**	оба как ..., так и
bottom, n	**['bɔtəm]**	дно
boxboard, n folding b.	**['bɔksbɔ:d]**	коробочный картон картон для складных коробок
break, v (broke, broken) b. down b. off	**[breɪk]**	ломать, разбивать разрушать полностью прерывать
breakdown, n	**['breɪkdaun]**	поломка, размельчение
bridging, n	**['brɪdʒɪŋ]**	сводообразование
bright, a	**[braɪt]**	яркий, белый
brightness, n	**['braɪtnɪs]**	белизна, яркость
bring, v (brought, brought) b. together	**[brɪŋ]**	приносить соединять
brittle, a	**['brɪtl]**	ломкий

buffer, v, n	**['bʌfə]**	противодействовать, буфер, амортизатор
build, v (built, built) build into build up	**[bɪld]**	строить встроить постепенно создавать
bulk, n	**[bʌlk]**	пухлость
bulky, a	**['bʌlkɪ]**	пухлый
burning, n	**['bənɪŋ]**	горение
C		
calender, n, v	**['kæləndə, 'kælɪndə]**	каландр, каландрировать
calculation, n	**[,kælkjə'leɪʃ(ə)n, ,kælkju'leɪʃ(ə)n]**	расчет
calliper, n	**['kælɪpə]**	калибр, толщина
can, n dryer c.	**[kæn]**	цилиндр сушильный цилиндр
cane, n	**[keɪn]**	тростник
capable, a	**['keɪpəbl]**	способный
capacity, n	**[kə'pæsətɪ]**	способность
carefully, adv.	**['kɛəf(ə)lɪ, 'kɛəfulɪ]**	осторожно
carrier, n	**['kærɪə]**	носитель
carry, v carry out	**['kærɪ]**	нести проводить, осуществлять
carton, n folding c.	**['ka:t(ə)n]**	тонкий картон складной картон
case, n	**[keɪs]**	ящик, случай
casual, a	**['kæʒjuəl]**	случайный
cause, n, v	**[kɔ:z]**	причина, дело, вызывать, заставлять
cell, n	**[sel]**	клетка
cement, n, v	**[sɪ'ment]**	цемент, скреплять, склеивать
chain, n	**[ʧeɪn]**	цепь
change, v	**[ʧeɪndʒ]**	менять
charge, n, v	**[ʧa:dʒ]**	загрузка, загружать
chemical, a, n	**['kemɪk(ə)l]**	химический, химикат
chip, n	**[ʧɪp]**	щепа
chipper, n	**['ʧɪpə]**	рубильная машина
chipping, n	**['ʧɪpɪŋ]**	рубка в щепу

chlorine, n	['klɔrɪn]	хлор
choice, n	[ʧɔɪs]	выбор
chute, n	[ʃu:t]	желоб
claim, v	[kleɪm]	утверждать
clarifier, n	['klærɪfaɪə]	осветлитель, отстойник
clay, n	[kleɪ]	глина
clean, v, a	[kli:n]	чистить, чистый
cleaner, n	['klinə]	очиститель
cleaning, n	['klinɪŋ]	очистка
clearance, n	['klɪər(ə)ns]	зазор, пространство
close, v, a	[kləus]	закрывать, закрытый
closely, adv.	['kləuslɪ]	близко, тесно
clothing, n	['kləuðɪŋ]	одежда
cloudy, a	['klaudɪ]	комковатый
clump, n, v	[klʌmp]	комок, сцепляться, склеиваться
coarse, a	[kɔs]	грубый
coarseness, n	['kɔs(ə)nəs]	грубость, зернистость
coat, v, n	[kəut]	покрывать, слой, покрытие
coater, n	['kəutə]	станок для нанесения покрытия
coating, n	['kəutɪŋ]	покровный слой, нанесение покрытия
collect, v	[kə'lekt]	собирать
collection, n	[kə'lekʃ(ə)n]	набор, сбор
colour (color), n	['kʌlə]	цвет
coloured, a	['kʌləd]	окрашенный
combine, v	[kəm'baɪn]	соединять
commercial, a	[kə'məʃ(ə)l]	коммерческий, деловой
common, a	['kɔmən]	общий, распространенный
compare, v	[kəm'pɛə]	сравнивать
competitive, a	[kəm'petɪtɪv]	конкурентоспособный
complete, v	[kəm'pli:t]	завершить
completely, adv.	[kəm'pli:tlɪ]	полностью
complexity, n	[kəm'pleksətɪ]	сложность

complicate, v	['kɔmplɪkeɪt]	усложнять
comply, v	[kəm'plaɪ]	подчиняться
component, n	[kəm'pəunənt]	составная часть
compose, v	[kəm'pəuz]	составлять, образовывать (ся)
compress, v	[kəm'pres]	сжимать (ся)
conclude, v	[kən'klu:d]	заключать
conclusion, n	[kən'klu:ʒ(ə)n]	вывод, заключение
condensates, n. pl.	[kən'denseɪt]	конденсаты
condense, v	[kən'dens]	конденсировать (ся)
condition, n	[kən'dɪʃ(ə)n]	условие, состояние
conduct, v	[kən'dʌkt]	проводить
conduction, n	[kən'dʌkʃ(ə)n]	перенос, передача
cone, n	[kəun]	конус
confusion, n	[kən'fju:ʒ(ə)n]	путаница
conjugation, n	[ˌkɔndʒu'geɪʃ(ə)n]	соединение
connect, v	[kə'nekt]	связывать, соединять
consider, v	[kən'sɪdə]	рассматривать, учитывать
considerable, a	[kən'sɪd(ə)rəbl]	значительный
considerably, adv.	[kən'sɪd(ə)rəblɪ]	значительно
consideration, n	[kənˌsɪd(ə)'reɪʃ(ə)n]	рассмотрение, соображение
consist, v	[kən'sɪst]	состоять (из)
consistency, n	[kən'sɪst(ə)nsɪ]	концентрация
consolidation, n	[kənˌsɔlɪ'deɪʃ(ə)n]	слияние, затвердевание
consumer, n	[kən'sju:mə]	потребитель, клиент
consumption, n	[kən'sʌmpʃ(ə)n]	потребление
contact, n, v	['kɔntækt]	соприкосновение, прикасаться
contain, v	[kən'teɪn]	содержать
contamination, n	[kənˌtæmɪ'neɪʃ(ə)n]	загрязнение
content, n	['kɔntent]	содержание
continue, v	[kən'tɪnju:]	продолжать
continued, a	[kən'tɪnju:d]	непрерывный, продолженный
continuous, a	[kən'tɪnjuəs]	непрерывный

contribute, v	[kən'trɪbju:t, 'kɔntrɪbju:t]	способствовать
control, n	[kən'trəul]	управление
convenient, a	[kən'vi:nɪənt]	удобный
conversion, n	[kən'və:ʃ(ə)n]	превращение, переход
converter, n	[kən'və:tə]	обработчик
converting, n	[kən'və:tɪŋ]	переработка
cook, n black c.	[kuk]	варка черная варка
cooking, n	['kukɪŋ]	варка
cooling, n	['ku:lɪŋ]	охлаждение
corn, n	[kɔ:n]	зерновое растение
corrugated, a	['kɔrəgeɪtɪd]	гофрированный
cost, n, v	[kɔst]	стоимость, стоить
cotton, n	['kɔt(ə)n]	хлопок
counteract, v	[,kaunt(ə)'rækt]	противодействовать, нейтрализовать
countercurrent, n	['kauntə,kʌr(ə)nt]	противоток
counterflow, n	['kauntə,fləu]	противоток
cover, v	['kʌvə]	покрывать
create, v	[krɪ'eɪt]	создавать
creeping, n	['krl:pɪŋ]	набегание
criss-cross, a	['krɪskrɔs]	перекрестный
cross, a	[krɔs]	поперечный
crush, v	[krʌʃ]	измельчать
curl, n, v	[kə:l]	завиток, завиваться, скручиваться
curling, n	['kə:lɪŋ]	завивка волокна
cut, v	[kʌt]	рубить, резать
cutting, n	['kʌtɪŋ]	рубка
	D	
damage, n	['dæmɪdʒ]	ущерб, повреждение
dark, a	[da:k]	темный
darken, v	['da:k(ə)n]	темнеть
data, n. pl.	['deɪtə]	данные
decision, n	[dɪ(:)'sɪʒ(ə)n]	решение

decline, v	[dɪ'klaɪn]	приходить в упадок
decrease, v	[dɪ'kri:s]	уменьшаться
defiber, v	[dɪ'faɪbə]	дефибрировать
degradation, n	[,degrə'deɪʃ(ə)n]	разложение, размельчение
degrade, v	[dɪ'greɪd]	снижать качество
degree, n	[dɪ'gri:]	степень, градус
deinking, n	[,dl:'ɪŋkɪŋ]	облагораживание (удаление печатной краски)
deliver, v	[dɪ'lɪvə]	доставлять
demand, n biological oxygen d. v	[dɪ'ma:nd]	потребность, спрос биологическая потребность в кислороде, БПК требовать
dense, a	[dens]	плотный
density, n	['densɪtɪ]	плотность
depend, v	[dɪ'pend]	зависеть
dependence, n	[dɪ'pendəns]	зависимость
dependent, a	[dɪ'pendənt]	зависимый
deposit, v	[dɪ'pɔzɪt]	отлагать
derivative, n	[dɪ'rɪvətɪv]	производное
derive, v	[dɪ'raɪv]	происходить
describe, v	[dɪ'skraɪb]	описывать
design, v, n	[dɪ'zaɪn]	проектировать, предназначать проект
desirable, a	[dɪ'zaɪərəbl]	желательный
desire, v	[dɪ'zaɪə]	желать
determinant, a	[dɪ'tə:mɪnənt]	определяющий
determine, v	[dɪ'tə:mɪn]	определять
develop, v	[dɪ'veləp]	развивать (ся), разрабатывать
development, n	[dɪ'veləpmənt]	развитие, разработка
device, n	[dɪ'vaɪs]	устройство
dewatering, n	[dɪ'wɔt(ə)rɪŋ]	обезвоживание
die, v	[daɪ]	умирать
differ, v	['dɪfə]	отличаться

difference, n	['dɪf(ə)r(ə)ns]	различие
difficulty, n	['dɪfɪk(ə)ltɪ]	трудность
digest, v	[daɪ'dʒest], [dɪ'dʒest]	варить
digester, n continuous d.	[dɪ'dʒestə]	варочный котел варочный котел непрерывного действия
digestion, n batch d. continuous d.	[dɪ'dʒestʃ(ə)n]	варка периодическая варка непрерывная варка
dilute, v, a	[daɪ'lju:t]	растворять, растворенный
dilution, n	[daɪ'lu:ʃ(ə)n]	разбавление, растворение
dimension, n	[dɪ'menʃ(ə)n]	размер
diminish, v	[dɪ'mɪnɪʃ]	уменьшать
dioxide, n	[daɪ'ɔksaɪd]	двуокись
dip, v	[dɪp]	погружать
direct, v, a	[dɪ'rekt], [daɪ'rekt]	направлять, прямой
directly, adv.	[dɪ'rektlɪ, daɪ'rektlɪ]	прямо
disadvantage, n	[ˌdɪsəd'va:ntɪdʒ]	недостаток
discharge, v	[dɪs'ʧa:dʒ]	разгружать
discoloration, n	[dɪsˌkʌlə'reɪʃ(ə)n]	обесцвечивание
disintegrate, v	[dɪ'sɪntɪgreɪt]	размельчать, разделять
disperse, v	[dɪ'spə:s]	диспергировать, рассеивать
displacement, n	[dɪs'pleɪsmənt]	смещение
display, v	[dɪs'pleɪ]	показать
disrupt, v	[dɪs'rʌpt]	разрывать
dissolve, v	[dɪ'zɔlv]	растворять
distribute, v	[dɪs'trɪbju:t]	распределять
distributor, n	[dɪs'trɪbjətə]	распределитель
diversity, n	[daɪ'və:sɪtɪ]	разнообразие
divide, v	[dɪ'vaɪd]	делить
division, n	[dɪ'vɪʒ(ə)n]	деление
dome, n	[dəum]	купол
double, a	['dʌbl]	двойной
drain, v	[dreɪn]	обезвоживать

drill, v	[drɪl]	просверлить
drive, v (drove, driven)	[draɪv]	приводить в движение
dry, a, v	[draɪ]	сухой, сушить
dryer, n	['draɪə]	сушилка
drying, n	['draɪɪŋ]	сушка
dual, a	['dju:əl]	двойной
due, a to be due to due to prep.	[dju:]	должный объясняться чем-то благодаря
dump, v	[dʌmp]	сбрасывать
dye, n	[daɪ]	краситель
	E	
earth, n	[ə:θ]	земля
easily, adv.	['i:zɪlɪ]	легко
edge, n	[edʒ]	край, сторона
effect, n, v	[ɪ'fekt]	воздействие, действовать (на)
efficiency, n	[ɪ'fɪʃ(ə)nsɪ]	эффективность, производительность
efficient, a	[ɪ'fɪʃ(ə)nt], [ə'fɪʃ(ə)nt]	эффективный
effluent, n	['efluənt]	сток
either, a either ... or, conj.	['aɪðə]	любой или ... или
eliminate, v	[ɪ'lɪmɪneɪt]	устранять
embossing, n	[em'bɔsɪŋ]	тиснение
emission, n	[ɪ'mɪʃ(ə)n]	испускание, выделение
emit, v	[ɪ'mɪt]	выделять, испускать
emphasize, v	['emfəsaɪz]	предавать особое значение
employ, v	[ɪm'plɔɪ], [em'plɔɪ]	использовать
empty, a, v	['emptɪ]	пустой, опустошать
emulsify, v	[ɪ'mʌlsɪfaɪ]	эмульгировать
emulsion, n	[ɪ'mʌlʃ(ə)n]	эмульсия
end, n wet e.	[end]	конец мокрая часть (машины)
enhance, v	[ɪn'ha:ns]	увеличить, усилить
enormous, a	[ɪ'nɔ:məs]	огромный

ensure, v	[ɪn'ʃuə]	обеспечить
enter, v	['entə]	входить
entire, a	[ɪn'taɪə]	целый
enzyme, n	['enzaɪm]	энзим
equal, a	['i:kwəl]	равный
equilibrium, n	[ˌikwɪ'lɪbrɪəm]	равновесие
equipment, n	[ɪ'kwɪpmənt]	оборудование
erasure, n	[ɪ'reɪʒə]	эрозия
especially, adv.	[ɪs'peʃ(ə)lɪ]	особенно
essentially, adv.	[ɪ'senʃ(ə)lɪ]	по существу, в основном
establish, v	[ɪs'tæblɪʃ]	установить, обосновать (ся)
estimate, v	['estɪmeɪt]	оценивать, подсчитывать
evaluate, v	[ɪ'væljueɪt]	оценивать
evaluator, n	[ɪ,vælju'eɪtə]	оценочный показатель
evaporate, v	[ɪ'væp(ə)reɪt]	испарять
evaporation, n	[ɪ,væpə'reɪʃ(ə)n]	испарение
exceed, v	[ɪk'si:d]	превышать
exception, n	[ɪk'sepʃ(ə)n]	исключение
excess, a	[ɪk'ses]	излишний
exchanger heat e.	[ɪks'tʃeɪndʒə]	теплообменник
exist, v	[ɪg'zɪst]	существовать
exit, n	['eksɪt], ['egzɪt]	выход
expensive, a	[ɪk'spensɪv]	дорогой
explain, v	[ɪk'spleɪn, ek 'spleɪn]	объяснять
expose, v	[ɪk'spəuz], [ek 'spəuz]	выставлять, раскрывать
express, v	[ɪk'spres], [ek'spres]	выражать
expression, n	[ɪk'spreʃ(ə)n]	выражение
extend, v	[ɪk'stend], [ek'stend]	расширять
extensibility, n	[ɪk,stensə'bɪlətɪ]	растяжимость
extensively, adv.	[ɪk'stensɪvlɪ]	энергично, сильно
extent to a certain e.	[ɪk'stent], [ek'stent]	степень до определенной степени

external, a	[ɪk'stə:n(ə)l]	внешний
extract, v	[ɪk'strækt]	извлекать
extraction, n	[ɪk'strækʃ(ə)n]	извлечение, экстракция
extractor, n	[ɪk'stræktə]	экстрактор, извлекающее устройство
extremely, adv.	[ɪks'tri:mlɪ]	крайне, очень
	F	
facilitate, v	[fə'sɪlɪteɪt]	облегчать
facility, n	[fə'sɪlətɪ]	оборудование, приспособление
fairly, adv.	['fɛəlɪ]	довольно
fall, v (fell, fallen)	[fɔ:l]	падать
fast, a	[fa:st]	быстрый
favour, n in favour of v	['feɪvə]	польза за благоприятствовать
feature, n	['fiʧə]	черта
feed, v	[fi:d]	питать, подавать
feeder, n	['fi:də]	питатель
felt, n	[felt]	сукно
fibre, n virgin f. secondary f.	[faɪbə]	волокно первичное волокно вторичное волокно
fibril, n	['faɪbrɪl]	(целлюлозная) фибрилла
fibrillation, n	[ˌfaɪbrɪ'leɪʃ(ə)n]	фибриллирование
field, n	[fi:ld]	область
figure, n	['fɪgə]	цифра
fill, v	[fɪl]	наполнять
filler, n	['fɪlə]	наполнитель
film, n	[fɪlm]	пленка
find, v (found)	[faɪnd]	находить
fine, a	[faɪn]	тонкий
finished, a	['fɪnɪʃt]	конечный
fir, n	[fə:]	пихта
fit, v fit with	[fɪt]	приспособить снабдить
flange, n	[flændʒ]	фланец, выступ

flat, a	[flæt]	плоский
flexible, a	['fleksɪbl]	гибкий
float, n	[fləut]	пробка, плот
flocculate, v	['flɔkjəleɪt], '[flɔkjuleɪt]	выпадать хлопьями, образовывать хлопья
flocks, n.pl.	[flɔks]	хлопья
flood, n	[flʌd]	поток
floor, n	[flɔ:]	пол, рабочая площадка
flotation, floatation, n	[fləu'teɪʃ(ə)n]	плавучесть, флотация
flow, n, v	[fləu]	поток, течь
fluorine, n	['flɔri:n], ['fluəri:n]	фтор
flute, n, v	[flu:t]	гофра, гофрировать
fly, n	[flaɪ]	маховое колесо
foam, n	[fəum]	пена
follow, v	['fɔləu]	следовать
force, n, v force out	[fɔ:s]	сила, направлять, толкать выталкивать
foreign, a	['fɔrɪn]	посторонний
form, n, v	[fɔ:m]	форма, образовать, формовать
formaldehyde, n	[fɔ:'mældɪhaɪd]	формальдегид
formation, n	[fɔ:'meɪʃ(ə)n]	формование
former, n	['fɔ:mə]	формующая машина
forming, n	[fɔ:mɪn]	формование
fossil, a	['fɔs(ə)l]	ископаемое
fourdrinier, n	[,fuədrɪ'ni:]	длинносеточная машина
frequent, a	['fri:kwənt]	частый
frequently, adv.	['fri:kwəntlɪ]	часто
fuel, n	['fju:əl]	топливо
full, a	[ful]	полный
function, n to be function of v	['fʌŋkʃ(ə)n]	функция зависеть от действовать
furnace, n	['fə:nɪs]	печь
furnish, v, n	['fənɪʃ]	снабжать, обеспечивать композиция, наполнитель

further, a, adv.	['fə:ðə]	дальнейший, дальше
furthermore, adv.	[,fə:ðə'mɔ:]	кроме того
	G	
generally, adv.	['dʒen(ə)r(ə)lɪ]	обычно
generate, v	['dʒen(ə)reɪt]	порождать
give, v give off	[gɪv]	давать выделять
gloss, n	[glɔs]	лоск, лощение
glue, n, v	[glu:]	клей, склеивать
goal, n	[gəul]	цель
grade, n publication g. writing g.	[greɪd]	сорт бумаги печатные сорта писчие сорта
grammage, n	['græmɪdʒ]	вес в граммах на м
grass, n	[gra:s]	трава
gravity, n	['grævɪtɪ]	сила тяжести
grease, n	[gri:s]	жир, сало
grind, v (ground, ground)	[graɪnd]	размалывать
grinder, n	['graɪndə]	дефибрер
groundwood, n refiner g.	['graundwud]]	механическая масса древесная масса из щепы
grow, v (grew, grown)	[grəu]	расти
guard, v	[ga:d]	хранить
gum, n	[gʌm]	растительный клей
	H	
hand, n on the other hand	[hænd]	рука с другой стороны
handle, v	['hændl]	обрабатывать
handling, n	['hændlɪŋ]	обработка
handmade, a	['hænd'meɪd]	изготовленный ручным способом
hang, v (hung, hung)	[hæŋ]	подвесить, повесить
hardwood, n	['ha:dwud]	лиственная древесина
harm, n	[ha:m]	вред
harmful, a	['ha:mf(ə)l, 'ha:mful]	вредный
harvest, v, n	['ha:vɪst]	снимать урожай, урожай

headbox, n	['hedbɔks]	напорный ящик
header, n	['hedə]	водяной коллектор
heat, n, v	[hi:t]	тепло, нагревать
heater, n	['hi:tə]	нагреватель
heating, n	['hi:tɪŋ]	нагревание
heavy, a	['hevɪ]	тяжелый
help, v, n	[help]	помогать, помощь
hemicellulose, n	['hemɪ,seljələus]	гемицеллюлоза, полуцеллюлоза
hide, v (hid, hidden)	[haɪd]	скрывать
high, a	[haɪ]	высокий
hold, v (held)	[həuld]	держать
hole, n	[həul]	отверстие
hollow, a	['hɔləu]	пустой
hood, n dryer h.	[hud]	колпак (бумагоделательной машины, ролла) сушильный колпак, сушилка
however, cj.	[hau'evə]	однако
humid, a	['hju:mɪd]	влажный
humidity, n	[hju(:)'mɪdɪtɪ]	влажность
hydrogen, n	['haɪdrədʒən]	водород
hydroxide, n sodium h.	[haɪ'drɔksaɪd]	гидроксид гидроксид натрия
hypochlorite, n		гипохлорит
I		
identical, a	[aɪ'dentɪk(ə)l]	идентичный, тождественный
immediate, a	[ɪ'mi:dɪət] [ɪ'mi:djət]	непосредственный
immediately, adv.	[ɪ'mi:dɪətlɪ] [ɪ'mi:djətlɪ]	немедленно
impact, n	['ɪmpækt]	воздействие
impair, v	[ɪm'pɛə]	ослаблять, ухудшать качество
impart, v	[ɪm'pa:t]	придавать, сообщать
impinge, v	[ɪm'pɪndʒ]	сталкиваться
impingement, n	[ɪm'pɪndʒmənt]	столкновение

imply, v	[ɪm'plaɪ]	заключать в себе, подразумевать
importance, n	[ɪm'pɔ:t(ə)ns]	значение
impose, v	[ɪm'pəuz]	налагать
imprint, n	['ɪmprɪnt]	отпечаток
improve, v	[ɪm'pru:v]	улучшать, совершенствовать
improvement, n	[ɪm'pru:vmənt]	усовершенствование
impurities, n. pl.	[ɪm'pjuərətɪz]	примеси
incline, v	[ɪn'klaɪn]	наклонять
include, v	[ɪn'klu:d]	включать
incoming, a	['ɪn,kʌmɪŋ]	входящий
increase, v, n	[ɪn'kri:s]	увеличить, увеличение
indicate, v	['ɪndɪkeɪt]	указывать
influence, v, n	['ɪnfluəns]	влиять, влияние
ingredient, n	[ɪn'gri:dɪənt]	составная часть
initial, a	[ɪ'nɪʃ(ə)l]	первоначальный
ink, n	[ɪŋk]	чернила, типографская краска
insert, v	[ɪn'sə:t]	включать
inside, adv.	[,ɪn'saɪd]	внутри
integral, a	['ɪntɪgr(ə)l]	неотъемлемый
integrate, v	['ɪntɪgreɪt]	объединять (ся)
intend, v	[ɪn'tend]	предназначать
intensive, a energy i.	[ɪn'tensɪv]	интенсивный энергоемкий
interfere, v	[,ɪntə'fɪə]	вмешиваться
intermediate, a	[,ɪntə(:)'mi:djət]	промежуточный
internal, a	[ɪn'tə:n(ə)l]	внутренний
interruption, n	[,ɪntə'rʌpʃ(ə)n]	перерыв
introduce, v	[,ɪntrə'dju:s]	вводить
introduction, n	[,ɪntrə'dʌkʃ(ə)n]	введение
invent, v	[ɪn'vent]	изобретать
inverse, n	['ɪn'və:s]	противоположность
involve (in), v	[ɪn'vɔlv]	включать в себя
J		

justify, v	['dʒʌstɪfaɪ]	оправдать
K		
kaolin, n	['keɪəlɪn]	каолин
keep, v (kept, kept)	[ki:p]	держать
knot, n	[nɔt]	сучок
L		
last, v, a	[la:st]	длиться, последний
latter, a	['lætə]	последний
lay, v (laid)	[leɪ]	уложить, расположить
layer, n	['leɪə]	слой
lead, v (led)	[li:d]	вести к
leaf, n (pl. leaves)	[li:f]	лист
least, a at least	[li:st]	наименьший по крайней мере
leave, v (left)	[li:v]	оставлять
length, n	[leŋθ]	длина
level, n	['lev(ə)l]	уровень
liberate, v	['lɪb(ə)reɪt]	освобождать
liberation, n	[,lɪb(ə)'reɪʃ(ə)n]	освобождение
lid, n	[lɪd]	крышка
lift, v l. out	[lɪft]	поднимать вынимать
light, n	[laɪt]	свет
like, a, adv., v	[laɪk]	похожий, подобно, нравиться
likely, adv.	['laɪklɪ]	вероятно
limit, n, v	['lɪmɪt]	предел, ограничивать
liquor, n cooking l.	['lɪkwɔ:]	жидкость, раствор варочная жидкость
living, a	['lɪvɪŋ]	живой
load, v	[ləud]	загружать
locate, v	[ləu'keɪt]	располагать, определять место расположения
log, n	[lɔg]	бревно
long, a as long as, prep.	[lɔŋ]	длинный пока
longitudinal, a	[,lɔndʒɪ'tju:dɪn(ə)l]	продольный
loose, a	[lu:s]	свободный

loosely, adv.	['lu:slɪ]	свободно
lose, v (lost)	[lu:z]	терять
loss, n	[lɔs]	потеря
(a) lot of		много
low, a	[ləu]	низкий, нижний
lower, v	['ləuə]	понижать
lumber, n	['lʌmbə]	пиломатериалы
lumpy, a	['lʌmpɪ]	комковатый
M		
magnesium, n	[mæg'nl:zɪəm]	магний
main, a	[meɪn]	главный
maintain, v	[meɪn'teɪn]	поддерживать
maintenance, n	['meɪntənəns]	техническое обслуживание, содержание
major, a	['meɪdʒə]	главный
make, v make up, v make up, a	[meɪk]	делать пополнять дополнительный
making, n paper m.	['meɪkɪŋ]	изготовление бумагоделание
management, n	['mænɪdʒmənt]	управление
manufacture, v, n	[,mænjə'fæktʃə]	производить, изготовление
manufacturing, n	[,mænjə'fæktʃ(ə)rɪŋ]	производство
maple, n	['meɪpl]	клен
mat, n, a	[mæt]	слой, войлок, матовый
material, n raw m.	[mə'tɪərɪəl]	вещество, материал сырье
mean, v (ment)	[ml:n]	означать
means, n by means of		средство посредством
measure, v, n	['meʒə]	измерять, мера
measurement, n	['meʒəmənt]	измерение
medium, n	['ml:djəm] ['ml:dɪəm]	середина, среда
mention, v	['menʃ(ə)n]	упоминать
mesh, n	[meʃ]	ячейка

meter, n, v	['mi:tə]	метр, счетчик, измерительный прибор, измерять
micelle, n	[mɪ'sel]	мицелла, кристаллит
mill, n	[mɪl]	завод
mix, v	[mɪks]	смешивать
mixed, a	[mɪkst]	смешанный
mixing, n	['mɪksɪŋ]	смешивание
mixture, n	['mɪkstʃə]	смесь
modification, n	[,mɔdɪfɪ'keɪʃ(ə)n]	модификация
modify, v	['mɔdɪfaɪ]	модифицировать, видоизменять
moist, a	[mɔɪst]	влажный
moisture, n	['mɔɪstʃə]	влажность, влага
mold, n	[məuld]	форма
mount, v	[maunt]	монтировать
movable, a	['mu:vəbl]	подвижный
mulberry, n	['mʌlb(ə)rɪ]	тутовое дерево
multi-stage, a	['mʌltɪsteɪdʒ]]	многоступенчатый
	N	
nature, n	['neɪtʃə]	природа
necessary, a	['nesəs(ə)rɪ]	необходимый
necessitate, v	[nə'sesɪteɪt]	вынуждать
need, v, n	[ni:d]	нуждаться, необходимость
negate, v	[nɪ'geɪt]	отрицать
network, n	['netwə:k]	сеть
neutral, a	['nju:tr(ə)l]	нейтральный
nevertheless, adv.	[,nevəð(ə)'les]	однако, тем не менее
newness, n	['nju:nəs]	новизна
newsprint, n	['nju:zprɪnt]	газетная бумага
next, a	[nekst]	следующий
notable, a	['nəutəbl]	заметный, значительный
note, v	[nəut]	отмечать
noticeable, a	['nəutɪsəbl]	заметный
notify, v	['nəutɪfaɪ]	отмечать

number, n a number of	['nʌmbə]	число несколько, ряд
	O	
oak, n	[əuk]	дуб
observe, v	[əb'zə:v]	наблюдать
observer, n	[əb'zə:və]	наблюдатель
obstacle, n	['ɔbstəkl]	препятствие
obtain, v	[əb'teɪn]	получать
obvious, a	['ɔbvɪəs]	очевидный
obviously, adv.	['ɔbvɪəslɪ]	очевидно
occur, v	[ə'kə:]	происходить
odor, n	['əudə]	запах
off, adv.	[ɔf]	вне
offset, n, v	['ɔfset]	смещение, смещать
oil, n	[ɔɪl]	растительное масло, нефть
once, adv.	[wʌns]	один раз, служит для усиления союзов if, when
only, adv. the only, a	['əunlɪ]	только единственный
on-site, adv.	['ɔn'saɪt]	на месте
opacity, n	[ə'pæsətɪ]	непрозрачность
opaque, a	[ə'peɪk]	непрозрачный, светонепроницаемый
opaqueness, n	[ə'peɪknɪs]	светонепроницаемость
open, a, v	['əup(ə)n]	открытый, открывать
opening, n	['əup(ə)nɪŋ]	отверстие
operate, v	['ɔpəreɪt]	работать, приводить в действие
operation, n	[,ɔp(ə)'reɪʃ(ə)n]	работа, производство
opportunity, n	['ɔp(ə)reɪt]	возможность
opposite, a	['ɔpəzɪt]	противоположный
order, n in order to, prep. v	['ɔ:də]	приказ, порядок чтобы упорядочить, привести в порядок
original, a	[ə'rɪdʒ(ə)n(ə)l]	первоначальный
originally, adv.	[ə'rɪdʒ(ə)n(ə)lɪ]	первоначально
outer, a	['autə]	внешний

output, n	**['autput]**	выход, выпуск
outside, a	**[ˌaut'saɪd]**	наружный
overall, a	**['əuv(ə)rɔl]**	общий
overcooked, a	**['əuvə'kukt]**	переваренный
overheating, n	**['əuvə'hi:tɪŋ]**	перегрев
oversize, a	**['əuvə'saɪz]**	больше обычного размера
oxidize, v	**['ɔksɪdaɪz]**	окислять
	P	
package, n	**['pækɪdʒ]**	кипа, комплект
packaging, n	**['pækɪdʒɪŋ]**	упаковка
pad, n	**[pæd]**	слой, прослойка
paper, n bag p. cloth p. handmade p. lightweight p. printed p. wrapping p. writing p.	**['peɪpə]**	бумага мешочная бумага полотняная бумага бумага ручного отлива легкая бумага печатная макулатура оберточная бумага писчая бумага
paperboard, n	**['peɪpə'bɔ:d]**	картон
papermaking, n	**['peɪpə'meɪkɪŋ]**	бумагоделание
part, n take p.	**[pa:t]**	часть принимать участие
partial, a	**['pa:ʃ(ə)l]**	частичный
partially, adv.	**['pa:ʃ(ə)lɪ]**	частично
particle, n	**['pa:tɪkl]**	частица
particularly, adv.	**[pə'tɪkjuləlɪ]**	очень, особенно
pass, v, n	**[pa:s]**	проходить, прохождение
passage, n	**['pæsɪdʒ]**	прохождение
pattern, n	**['pætən]**	образец, рисунок
penetrate, v	**['penɪtreɪt]**	пропитывать, проникать
penetration, n	**[ˌpenɪ'treɪʃ(ə)n]**	пропитка
per capita	**[pə'kæpɪtə]**	на душу населения
percentage, n	**[pə'sentɪdʒ]**	процентное содержание
perform, v	**[pə'fɔ:m]**	выполнять, совершенствовать
performance, n	**[pə'fɔ:məns]**	характеристики, производительность

permanence, n	**['pə:mənəns]**	устойчивость, неизменяемость
permanent, a	**['pə:mənənt]**	долговременный
peroxide, n	**[pə'rɔksaɪd]**	перекись
persistence, n	**[pə'sɪst(ə)ns]**	устойчивость
photocopier, n	**['fəutəukɔpɪə]**	ксерокс
piece, n	**[pi:s]**	кусок, деталь
pile, n	**[paɪl]**	куча, пачка
pine, n	**[paɪn]**	сосна
pipe, n	**[paɪp]**	труба
piston, n	**['pɪstən]**	поршень
place, n, v take p.	**[pleɪs]**	место, поместить происходить
plant, n waste treatment p.	**[pla:nt]**	растение, завод установка для очистки отходов
plate, n	**[pleɪt]**	пластина
play, v	**[pleɪ]**	играть
plug, v, n	**[plʌg]**	закупоривать, пробка
pocket, n	**['pɔkɪt]**	карман
pollutant, n	**[pə'lu:t(ə)nt]**	загрязняющее вещество
pollution, n	**[pə'lu:ʃ(ə)n]**	загрязнение
poorly, adv.	**['puəlɪ]**	плохо
pore, n	**[pɔ:]**	пора
possibility, n	**[ˌpɔsə'bɪlɪtɪ]**	возможность
power, n	**['pauə]**	мощность, сила
powerful, a	**['pauəful]**	сильный
preconverted, a	**['pri:kən'və:tɪd]**	предварительно обработанный
predetermine, v	**['pri:dɪ'tə:mɪn]**	предопределять
predictable, a	**[prɪ'dɪktəbl]**	предсказуемый
predominant, a	**[prɪ'dɔmɪnənt]**	преобладающий
prefer, v	**[prɪ'fə:]**	предпочитать
preference, n	**['pref(ə)r(ə)ns]**	предпочтение
preparation, n	**[ˌprepə'reɪʃ(ə)n]**	приготовление
prescribe, v	**[prɪs'kraɪb]**	предписывать

presence, n	['prezns]	присутствие
present, v, a	a. ['preznt] v. [prɪ'zent]	преподнести, представлять присутствующий
press, v, n printing p. size p.	[pres]	прессовать, пресс печатный пресс клеильный пресс
pressing, n	['presɪŋ]	прессование
pressure, n	['preʃə]	давление
pressurize, v	['preʃəraɪz]	повышать давление
presteam, v	[pri:'sti:m]	предварительно пропарить
presteaming, n	[pri:'sti:mɪŋ]	предварительная пропарка
pretreat, v	[pri:'tri:t]	предварительно обработать
prevent, v	[prɪ'vent]	предупреждать
previously, adv	['pri:vjəslɪ]	ранее, предварительно
primarily, adv.	['praɪm(ə)rɪlɪ]	прежде всего
primary, a	['praɪmərɪ]	первичный, первостепенный
prime, a	[praɪm]	первый, первостепенный
printability, n	[ˌprɪntə'bɪlɪtɪ]	пригодность для печатания
printing, n	['prɪntɪŋ]	печатание, печать
prior, prep.	['praɪə]	до
procedure, n	[prə'si:dʒə]	процесс производства
proceed, v	[prə'si:d]	происходить
process, v, n high-yield p. soda p.	n. ['prəuses] v. ['prəu,ses]	обрабатывать, процесс процесс с высоким выходом натронный процесс
processor, n	['prəusesə]	обработчик
production, n	[prə'dʌkʃ(ə)n]	производство
promote, v	[prə'məut]	содействовать продвижению
protect, v	[prə'tekt]	защищать
prove, v	[pru:v]	доказывать
provide, v	[prə'vaɪd]	обеспечить
provided, cj., a	[prə'vaɪdɪd]	при условии, если; обеспеченный
pull, v	[pul]	толкать, тащить
pulp, n refiner chemical mechanical p.	[pʌlp]	целлюлоза, бум. масса, древесная масса из щепы

pulper, n	['pʌlpə]	разбиватель (целлюлозы)
pulping, n batch p. continuous p.	['pʌlpɪŋ]	превращение в полумассу, варка (целлюлозы), дефибрирование периодическая варка непрерывная варка
pulpmill, n	['pʌlpmɪl]	целлюлозный завод
pump, n, v	[pʌmp]	насос, накачивать
purchase, v, n	['pə:tʃəs]	покупать, покупка
pure, a	[pjuə]	чистый
purification, n	[ˌpjuərɪfɪ'keɪʃ(ə)n]	очистка
purity, n	['pjuərɪtɪ]	чистота
purpose, n	['pə:pəs]	цель
push, v	[puʃ]	толкать
	Q	
quality, n	['kwɔlɪtɪ]	качество
quantity, n	['kwɔntɪtɪ]	количество
queue, n	[kju:]	очередь
	R	
rags, n. pl.	[rægz]	тряпьё
rain, n	[reɪn]	дождь
raise, v	[reɪz]	поднимать (ся), выращивать
random, a	['rændəm]	случайный
range, n, v	[reɪndʒ]	ряд, диапазон классифицировать, выстраивать
rapidly, adv.	['ræpɪdlɪ]	быстро
rate, n	[reɪt]	норма, скорость
ratio, n	['reɪʃɪəu]	отношение, пропорция
reach, v	[ri:tʃ]	достигать
react, v	[rɪ(:)'ækt]	реагировать
readily, adv.	['redɪlɪ]	охотно
ready, a, v	['redɪ]	готовый, готовить
ream, n	[ri:m]	стопа (бумаги)
reason, n	['rɪ:zn]	разум, причина
reasonable, a	['ri:znəbl]	разумный

receive, v	**[rɪ'si:v]**	получать
recently, adv.	**['ri:sntlɪ]**	недавно
reclaim, v	**['ri:'kleɪm]**	требовать
recognize, v	**['rekəgnaɪz]**	признавать
record, v, n	**n. ['rekɔ:d]** **v. [rɪ'kɔ:d]**	записывать, регистрировать запись
recover, v	**[rɪ'kʌvə]**	восстановить
recovery, n	**[rɪ'kʌvərɪ]**	восстановление, улавливание
recycle, v	**[ri:'saɪkl]**	рециркулировать, пропускать
reduce, v	**[rɪ'dju:s]**	сокращать, превращать, восстанавливать
reduction, n	**[rɪ'dʌkʃ(ə)n]**	восстановление, уменьшение
refer, v	**[rɪ'fə:]**	ссылаться, относиться, называть
refine, v	**[rɪ'faɪn]**	размалывать, совершенствовать
refiner, n	**[rɪ'faɪnə]**	рафинер
refining, n	**[rɪ'faɪnɪŋ]**	рафинирование, размол
reflectance, n	**[rɪ'flekt(ə)ns]**	отражение
regulations, n.pl.	**[ˌregju'leɪʃ(ə)n]**	правила
reject, n, v	**n. ['rɪ:dʒekt]** **v. [rɪ'dʒekt]**	отбросы, отбрасывать
relate, v	**[rɪ'leɪt]**	связывать
relationship, n	**[rɪ'leɪʃ(ə)nʃɪp]**	связь, отношение
relative, a	**['relətɪv]**	относительный
relatively, adv.	**['relətɪvlɪ]**	относительно
release, v, n	**[rɪ'li:s]**	выделять, освобождать выделение
rely, v	**[rɪ'laɪ]**	полагаться
remain, v	**[rɪ'meɪn]**	оставаться
remember, v	**[rɪ'membə]**	помнить
removal, n	**[rɪ'mu:v(ə)l]**	удаление
remove, v	**[rɪ'mu:v]**	удалять
render, v	**['rendə]**	отдавать, делать
repeat, v	**[rɪ'pi:t]**	повторять

repellency, n water r.	**[rɪ'peləns ɪ]**	отталкивающая способность гидрофобность
replace, v	**[rɪ'pleɪs]**	заменять
replacement, n	**[rɪ'pleɪsmənt]**	замена
replenish, v	**[rɪ'plenɪʃ]**	наполнить
report, v	**[rɪ'pɔ:t]**	сообщать
represent, v	**[ˌreprɪ'zent]**	представлять
representative, a, n	**[ˌreprɪ'zentətɪv]**	представительный представитель
reprocess, v	**['ri:'prəuses]**	подвергать повторной переработке
require, v	**[rɪ'kwaɪə]**	требовать
resistance, n tearing r. water r.	**[rɪ'zɪst(ə)ns]**	сопротивление, устойчивость сопротивление раздиранию водонепроницаемость
resort, v	**[rɪ'zɔ:t]**	пересортировать
respect, n in this respect with respect to	**[rɪs'pekt]**	отношение, касательство в этом отношении что касается, относительно
restore, v	**[rɪs'tɔ:]**	восстановить
result, n, v r. in r. from	**[rɪ'zʌlt]**	результат, приводить к привести к быть результатом чего-то
retain, v	**[rɪ'teɪn]**	удерживать
retard, v	**[rɪ'ta:d]**	задерживать
return, v, n	**[rɪ'tə:n]**	возвращаться, возвращение
reuse, v, n	**n. [ri:'ju:s]** **v. [ri:'ju:z]**	повторно использовать повторное использование
revolve, v	**[rɪ'vɔlv]**	вращать (ся)
rewinding, n	**[ˌrɪ:'waɪndɪŋ]**	перемотка
ribbon, n	**['rɪbən]**	лента
rigid, a	**['rɪdʒɪd]**	жесткий
ring, n	**[rɪŋ]**	кольцо
rise, v (rose, risen)	**[raɪz]**	подниматься, вставать
roll, n backing r. brest r. guide r. wire guide r.	**[rəul]**	вал опорный вал грудной вал направляющий валик сетковедущий валик
roller, n	**['rəulə]**	вал

roof, n	**[ru:f]**	крыша
room, n cooking r.	**[ru:m]**	цех варочный цех
rosin, n	**['rɔzɪn]**	канифоль
rotary, a	**['rəutərɪ]**	вращающийся
rotate, v	**[rəu'teɪt]**	вращать (ся)
rotation, n	**[rəu'teɪʃ(ə)n]**	вращение
rough, a	**[rʌf]**	грубый, шероховатый
route, n take a r.	**[ru:t]**	дорога, путь идти путем
rub, v	**[rʌb]**	тереть (ся)
rubbing, n	**['rʌbɪŋ]**	истирание
S		
sack, n	**[sæk]**	мешок
same, pron., a	**[seɪm]**	как, тот же самый
sample, n	**['sa:mpl]**	образец
satisfy, v	**['sætɪsfaɪ]**	удовлетворять
saturated, a	**['sætʃəreɪtɪd]**	насыщенный
save, v	**[seɪv]**	экономить
saving, n, n. pl.	**['seɪvɪŋ]**	экономия, скоп, ловушечная масса
sawmill, n	**['sɔ:mɪl]**	лесопильный завод
scale, n	**[skeɪl]**	шкала, накипь, окалина
scatter, v	**['skætə]**	рассеивать (ся)
scattering, n	**['skætərɪŋ]**	рассеивание
scratch, n	**[skrætʃ]**	царапина
screen, n, v	**[skri:n]**	сортировка, сортировать
screener, n	**['skrɪ:nə]**	сортировка
screening, n	**['skri:nɪŋ]**	сортирование
seal, v	**[si:l]**	плотно закрывать
secondary, a	**['sek(ə)nd(ə)rɪ]**	вторичный
secure, v	**[sɪ'kjuə]**	закреплять, охранять, гарантировать
see, v (saw, seen)	**[si:]**	видеть
seldom, adv.	**['seldəm]**	редко
select, v	**[sɪ'lekt]**	отбирать

selection, n	**[sɪ'lekʃ(ə)n]**	отбор
semichemical, a	**['semɪ'kemɪk(ə)l]**	полухимический
send, v (sent)	**[send]**	посылать
sensitive, a	**['sensɪtɪv]**	чувствительный
separable, a	**['sep(ə)rəbl]**	отдельный
separate, v, a	**a. ['seprɪt]** **v. ['sepəreɪt]**	разделять, отдельный
separator, n	**['sepəreɪtə]**	ловушка, сепаратор
sequence, n	**['si:kwəns]**	последовательность
sequential, a	**[sɪ'kwenʃ(ə)l]**	последовательный
settle, v	**['setl]**	осаждаться
several, a	**['sevr(ə)l]**	несколько
shape, n	**[ʃeɪp]**	форма
shear, n, v	**[ʃɪə]**	разрез, резать
sheet, n	**[ʃi:t]**	лист, бумажное полотно
sheeting, n	**['ʃi:tɪŋ]**	нарезание листов бум. полотна
shift, v, n	**[ʃɪft]**	смещаться, смещение
ship, v	**[ʃɪp]**	отправлять
shipping, n	**['ʃɪpɪŋ]**	отправка
short, a	**[ʃɔ:t]**	короткий
shorten, v	**['ʃɔ:tn]**	укорачивать
show, v (showed, shown)	**[ʃəu]**	показывать
shower, n	**['ʃauə]**	спрыск
side, n back s. side by side	**[saɪd]**	сторона обратная сторона рядом
similar, a	**['sɪmɪlə]**	подобный
similarity, n	**[ˌsɪmɪ'lærɪtɪ]**	сходство
simple, a	**['sɪmpl]**	простой
simulate, v	**['sɪmjuleɪt]**	имитировать
simulation, n	**[ˌsɪmju'leɪʃ(ə)n]**	моделирование
since, adv., prep., cj.	**[sɪns]**	с тех пор как, с, после, так как
single, a	**['sɪŋgl]**	единственный, один

site, n	**[saɪt]**	месторасположение
size, n, v	**[saɪz]**	клей, размер, проклеивать
sizing, n internal s. surface s.	**['saɪzɪŋ]**	проклейка, сортирование (по размерам) проклейка в массе поверхностная проклейка
slice, n	**[slaɪs]**	линейка бумагоделательной машины
slightly, adv.	**['slaɪtlɪ]**	слегка
slot, n	**[slɔt]**	щель
slow, a, v	**[sləu]**	медленный, замедлять
sludge, n	**[slʌdʒ]**	отстой, грязь
slurry, n	**['slə:rɪ]**	суспензия
small, a	**[smɔ:l]**	маленький
smell, v, n	**[smel]**	пахнуть, запах
smooth, a	**[smu:ð]**	гладкий, ровный
smoothness, n	**['smu:ðnɪs]**	гладкость
soak, v	**[səuk]**	вымачивать
soap, n	**[səup]**	мыло
sodium, n	**['səudjəm]**	натрий
soft, a	**[sɔft]**	мягкий
soften, v	**['sɔfn]**	смягчать
softwood, n	**['sɔftwud]**	хвойная древесина
sole, a	**[səul]**	единственный
soluble, a	**['sɔljubl]**	растворимый
solution, n	**[sə'lu:ʃ(ə)n]**	раствор; решение
some, pron., a, adv.	**[sʌm]**	кое-кто, некоторые, некоторый, несколько
sort, n, v	**[sɔ:t]**	сорт, сортировать
source, n	**[sɔ:s]**	источник
spatial, a	**['speɪʃ(ə)l]**	пространственный
species, n	**['spi:ʃi:z]**	вид
speed, n	**[spi:d]**	скорость
spend, v (spent)	**[spend]**	тратить
spent, a	**[spent]**	отработанный

spilled, a	**[spɪld]**	разлитый
splash, v	**[splæʃ]**	брызгать
split, v	**[splɪt]**	расщеплять
spray, n, v	**[spreɪ]**	струя, опрыскивать
spread, v	**[spred]**	распространять
spruce, n	**[spru:s]**	ель
square, n	**[skwɛə]**	квадрат
squeeze, v	**[skwi:z]**	сжимать
stability, n	**[stə'bɪlɪtɪ]**	устойчивость
stack, n	**[stæk]**	установка
staff, n	**[sta:f]**	штат служащих
stand, v (stood)	**[stænd]**	выдерживать
starch, n	**[sta:tʃ]**	крахмал
start, v start up	**[sta:t]**	начинать запустить (машину)
static, a	**['stætɪk]**	статический, неподвижный
steam, n live s.	**[sti:m]**	пар острый пар
stick, v (stuck, stuck)	**[stɪk]**	прилипать
stiff, a	**[stɪf]**	жесткий
stiffness, n	**['stɪfnɪs]**	жесткость
stock, n	**[stɔk]**	запас, масса
stockpile, v	**['stɔkpaɪl]**	делать запасы
stone, n	**[stəun]**	дефибрерный камень
storage, n	**['stɔ:rɪdʒ]**	хранение
store, v	**[stɔ:]**	хранить, складывать
strain, n stress s.	**[streɪn]**	натяжение сила натяжения
strainer, n ring s.	**['streɪnə]**	узловитель, сортировка кольцевой узловитель
strand, n	**[strænd]**	слой, пучок волокон
straw, n	**[strɔ:]**	солома
stream, n	**[strɪ:m]**	поток
strength, n wet s.	**[streŋθ]**	прочность влагостойкость
stretch, n, v	**[stretʃ]**	растяжение, растягивать

stretching, n	['stretʃɪŋ]	растяжение
strong, a	[strɔŋ]	прочный
subject, n, v	n. ['sʌbdʒɪkt] v. [səb'dʒekt]	предмет, подвергать
suboperation, n	['sʌbɔp(ə)'reɪʃ(ə)n]	часть операции
subsequent, a	['sʌbsɪkwənt]	последующий
substance, n	['sʌbst(ə)ns]	вещество
substantially, adv.	[səb'stænʃəlɪ]	основательно
suffer, v	['sʌfə]	страдать
suffice, v	[sə'faɪs]	быть достаточным
sufficient, a	[s(ə)'fɪʃ(ə)nt]	достаточный
suit, v	[sju:t]	подходить, приспосабливать
suitable, a	['sju:təbl]	подходящий
suited, a	['sju:tɪd]	пригодный
sulfate, n	['sʌlfeɪt]	сульфат
summarize, v	['sʌməraɪz]	обобщать
superheated, a	['sju:pəhi:tɪd]	перегретый
supplier, n	[sə'plaɪə]	поставщик
supply, n, v	[sə'plaɪ]	поставка, подача, подавать
support, v	[sə'pɔ:t]	поддерживать
surface, n	['sə:fɪs]	поверхность
suspend, v	[səs'pend]	превращать в состояние суспензии
swell, v	[swel]	разбухать
T		
take, v (took, taken)	[teɪk]	брать
tank, n	[tæŋk]	бак
tear, v (tore, torn)	[tɛə]	рвать
technique, n	[tek'ni:k]	техника, метод
tend, v	[tend]	стремиться
tension, n	['tenʃ(ə)n]	натяжение
term, n in terms of	[tə:m]	термин, условие с точки зрения
test, n mullen t.	[test]	тест тест на разрыв
testing, n	['testɪŋ]	тестирование

therefore, adv.	['ðɛəfɔ:]	поэтому
thick, a	[θɪk]	густо
thicken, v	['θɪk(ə)n]	сгущать
thickener, n	['θɪk(ə)nə]	сгуститель
thickness, n	['θɪknɪs]	толщина, плотность
thin, a	[θɪn]	тонкий
thread, n	[θred]	нить
tightly, adv.	['taɪtlɪ]	плотно
time, n	[taɪm]	время, раз
tinctorial, a	[tɪŋk'tɔ:rɪəl]	красильный
tissue, n	['tɪʃu:]	тонкая бумага, ткань
tolerate, v	['tɔlərеɪt]	допускать
top, n	[tɔp]	верх
touch, n	[tʌtʃ]	прикосновение
towards, prep.	[tə'wɔ:dz]	по направлению к...
toweling, n	['tauəlɪŋ]	материал для салфеток и полотенец
tower, n bleach t.	['tauə]	башня отбельная башня
tracheid, n	[trə'ki:əd]	трахеида, сосудовидная клетка
transfer, n, v	n. ['trænsfə(:)] v. [træns'fə:]	перенос, переносить
transmit, v	[trænz'mɪt]	передавать
transparent, a	[træns'pɛər(ə)nt]	прозрачный
treat, v	[tri:t]	обрабатывать
treatment, n	['tri:tmənt]	обработка
tree, n broad-leaved t. evergreen t. needle-bearing t.	[tri:]	дерево широколиственное дерево вечнозеленое дерево хвойное дерево
trim, n, v	[trɪm]	подрезка, обрезать
truly, adv.	['tru:lɪ]	точно
tube, n	[tju:b]	труба
U		
unbleached, a	['ʌn'bliʧt]	небелёный
uncooked, a	['ʌn'kukt]	непроваренный

under, adv., prep.	['ʌndə]	ниже, под
undesirable, a	['ʌndɪ'zaɪərəbl]	нежелательный
uniform, a	['ju:nɪfɔ:m]	однородный
uniformity, n	[,ju:nɪ'fɔ:mɪtɪ]	однородность
unit, n	['ju:nɪt]	единица, установка
unpleasant, a	[ʌn'pleznt]	неприятный
unwind, n	['ʌn'waɪnd]	раскат
useful, a	['ju:sful]	полезный
usefulness, n	['ju:sfulnɪs]	польза
V		
valuable, a	['væljuəbl]	ценный
valve, n steam v.	[vælv]	клапан паровой вентиль
vaporization, n	[,veɪpəraɪ'zeɪʃ(ə)n]	парообразование
vapour, n	['veɪpə]	пар
variable, a, n	['vɛərɪəbl]	разнообразный переменная величина
variety, n	[və'raɪətɪ]	разновидность
vary, v	['vɛərɪ]	изменяться
vat, n	[væt]	чан
vegetable, a	['vedʒɪtəbl]	растительный
versatility, n	[,və:sə'tɪlɪtɪ]	универсальность
vessel, n presteaming v.	['vesl]	сосуд, резервуар резервуар для предварительной пропарки
viscosity, n	[vɪs'kɔsɪtɪ]	вязкость
visible, a	['vɪzəbl]	видимый
void, n	[vɔɪd]	пора
volatile, a	['vɔlətaɪl]	летучий
volume, n	['vɔljum]	объем
W		
wall, n	[wɔ:l]	стена
wash, v wash off	[wɔʃ]	промывать смывать
washer, n drum w.	['wɔʃə]	промывной аппарат промывной барабан
washing, n	['wɔʃɪŋ]	промывка

waste, a, n	[weɪst]	обработанный, отходы
wastepaper, n	['weɪst'peɪpə]	макулатура
water, n circulating w. fresh w. wash w. waste w. white w.	['wɔ:tə]	вода оборотная вода пресная вода промывная вода сточная вода оборотная вода
waterproof, a	['wɔtəpru:f]	водонепроницаемый
wax, n	[wæks]	воск
way, n	[weɪ]	способ, путь
weak, a	[wi:k]	слабый
web, n	[web]	бумажное полотно
weight, n basis w.	[weɪt]	вес плотность (бумаги)
wet, a, v	[wet]	влажный, увлажнять
whereas, cj.	[wɛər'æz]	тогда как
whiteness, n	['waɪtnɪs]	белизна
whole, a	[həul]	целый, невредимый
width, n	[wɪdθ]	ширина
wild, a	[waɪld]	беспорядочный
wire, n	['waɪə]	сетка
withstand, v	[wɪð'stænd]	выносить
wood, n hardwood, n softwood, n	[wud]	древесина лиственная древесина еловая древесина
worth, n	[wə:θ]	цена, стоимость, достоинства
woven, a	['wəuv(ə)n]	тканый
wrap, v	[ræp]	завертывать
wrinkle, n, v	['rɪŋkl]	морщина, складка, морщить (ся)
Y		
yellow, a, v	['jeləu]	желтый, желтеть
yield, n	[ji:ld]	выход (продукции)

Содержание

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