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НЕФТЕГАЗОВАЯ ОТРАСЛЬ. АНГЛИЙСКИЙ ЯЗЫК

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Учебное пособие включает десять тем-разделов, словарь и одиннадцать приложений. Цель пособия – овладение основной терминологией и развитие навыков чтения и перевода научно-технической литературы в области нефтегазовой промышленности. Направленность на преобладание самостоятельной работы с пособием является его характерной чертой.

Учебное пособие предназначено для студентов, обучающихся по направлениям 18.03.01 (240100), 18.03.02 (241000.62), 15.03.02 (151000.62), 15.04.02 (151000.68), специальности 45.05.01 (035701), а также широкого круга лиц, интересующихся данной проблематикой.

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Цель пособия – помочь студентам усвоить терминологический минимум, необходимый для понимания и перевода научно-технической литературы по данной тематике. Пособие состоит из 10 разделов (Units), посвященных отдельным темам. В каждый раздел входит один или два текста для лингвистического анализа и перевода, предтекстовые и послетекстовые упражнения. В конце пособия предлагается краткий англо-русский терминологический словарь и одиннадцать приложений, материал которых преподаватель может использовать по своему усмотрению.

Цель предтекстовых упражнений (Pre-text activities) – подготовка лексической базы к данной теме, активное овладение научно-технической терминологией с учетом использования различных словарей и справочной литературы. Послетекстовые упражнения (Exercises) направлены на закрепление лексического материала, преодоление языковых трудностей, характерных для языка научно-технической литературы.

Словарь построен в алфавитном порядке, термины и фразеологические сочетания приводятся в нем в том значении, в котором они употреблены в текстах пособия.

В приложении 1 представлены основные словообразовательные модели английского языка. Приложение 2 знакомит со списком неправильных глаголов. Приложение 3 рекомендуется использовать для закрепления грамматических навыков. В приложениях 4 и 5 приведены наиболее часто встречающиеся в текстах сокращения и неочевидные размерности соответственно. Приложение 6 содержит сведения об аннотировании, реферировании и рецензировании научно-технической литературы. В приложении 7 можно ознакомиться с информацией об особенностях перевода рекламных текстов и самими текстами, взятыми из специализированных журналов. В приложении 8 предлагаются дополнительные тексты для перевода, анно-

тирования, реферирования и рецензирования. Упражнения для контроля навыков письменного перевода представлены в приложении 9. Приложение 10 включает журнальные блоки новостей, посвященные проблемам нефтегазовой отрасли, которые можно использовать на занятиях для тренировки устного последовательного перевода с английского языка на русский или перевода с листа. В приложении 11 можно найти общие требования к адекватному переводу.

Данное учебное пособие рассчитано на 50-60 ч аудиторной работы.

UNIT 1

PRE-TEXT ACTIVITIES

1. Work with the dictionary and the vocabulary in this manual, find the meaning of the words and word combinations given below and memorize them. Pay particular attention to their pronunciation.

electric desalting unit, high content, cause (v), cause great losses, refinery, handle (v), deposit, still and heat exchanger tubes, process (v), affect (v), heat transfer, rate, vessel, valve, fuel consumption, loss in capacity, finished product manufacturing cost, processing unit, ash, residual, utilization, petroleum, purification of crudes, purify, refining (n), dehydrate, engineering and economic calculations, expediency, application, volume, a set of settling tanks, settler, quality.

2. Find the proper Russian equivalents (B) for the following English terms and phrases (A).

A. 1) refinery; 2) heat exchanger; 3) heat transfer; 4) fuel consumption; 5) expediency; 6) purification of petroleum; 7) finished product; 8) loss; 9) deposit; 10) still tubes.

B. 1) готовый продукт; 2) очистка нефти; 3) расход топлива; 4) теплопередача; 5) теплообменник; 6) нефтеперерабатывающий завод; 7) потеря; 8) отложение; 9) трубы печей; 10) целесообразность.

3. Find the proper English equivalents (B) for the following Russian terms (A).

A. 1) клапан; 2) сосуд; 3) качество; 4) остаточный; 5) отстойник; 6) нефтепереработка; 7) установка; 8) топливо; 9) расход; 10) производительность.

B. 1) fuel; 2) settling tank; 3) vessel; 4) consumption; 5) valve; 6) capacity; 7) residual; 8) refining; 9) unit; 10) quality.

4. Find the proper definition.

1) Settling tank.	1) The process of losing water.
2) Desalting.	2) A factory for the purification of some crude material, such as ore, sugar, oil, etc.
3) Dehydration.	3) The process of removing salts.
4) Refinery.	4) A tank where deposits are settled.

5. Translate and memorize the following words and their derivatives (for reference see Appendix 1).

salt (n) – salt (v) – desalt – salted – desalted
electric – electrician – electricity – electrification – electrify – electrified
fine (adj) – fine (v) – refine – refined – refinery
consume – consumer – consumption – consumed
pure – impure – purity – purify – purification – purifier

Text 1

ELECTRIC DESALTING UNIT

It is generally known that high content of salt and water in the crude oil causes great losses to refineries handling such crudes.

Salts give deposits in still and heat exchanger tubes, where high salt content crudes are processed, thus considerably affecting the heat transfer rate and causing corrosion of vessels, machinery, valves and pipes as well as increased fuel consumption, loss in capacity of the processing units, and great increase of finished products manufacturing cost. Apart from this, increased ash content in residual products makes their full utilization a difficult and sometimes even impossible thing.

Considering all said above, particular attention has been paid by the petroleum industry during the last years to problems involved in purification of crudes before refining. Electric dehydrating and desalting processes became widespread as a result.

Operating practice as well as repeated engineering and economic calculation have confirmed the expediency of thorough preparation of crudes in refineries.

The electric desalting unit described below is a most modern type having recently found a wide application.

The unit comprises two spherical electric dehydrating tanks of 600 cu. m volume each and a set of settling tanks. It can operate either in two or in three stages, depending on the quality of the crude to be handled.

EXERCISES

1. Translate Text 1 in written form.

2. Fill in the blanks with the proper word or word combination given below. Indicate your choice by letters. Translate the sentences.

1) High contents of salt and water in the crude oil cause great … to refineries. 2) Salts give … in still and heat exchanger tubes. 3) The unit comprises two spherical electric dehydrating …. 4) The … of each tank is 600 cu. m. 5) Particular … has been paid by petroleum industry to this problem. 6) Salts cause … of vessels.

a) tanks, b) losses, c) attention, d) deposits, e) volume, f) corrosion.

3. Translate the following passage from Russian into English without a dictionary.

Данная электрообессоливающая установка применяется непосредственно перед переработкой сырой нефти, поскольку отложения солей в трубах являются причиной возникновения коррозии оборудования. Кроме того, наличие солей вызывает повышенный расход топлива и снижение производительности технологических установок. Немаловажное значение для работы установки имеет и качество нефти, подлежащей переработке.

PRE-TEXT ACTIVITIES

1. Work with the dictionary and the vocabulary in this manual, find the meaning of the words and word combinations given below and memorize them. Pay particular attention to their pronunciation.

flow diagram (flow sheet), storage tank, steam heater, injection, stream, demulsifying agent (demulsifier), sediments, caustic solution, controlled-volume feed pump, distribution heads, clearances, high-potential electrostatic field, precipitation space, release, suction side of a pump, strainer, drainage system, pressure, maintain, combined operation, intermediate rundown tank, rest (v), design (v), support (n), composition, surface, initial contamination, treat (v), traces, washing (n), grade.

2. Find the proper Russian equivalents (B) for the following English terms and phrases (A).

A. 1) washing; 2) grade; 3) precipitation space; 4) distribution heads; 5) injection; 6) suction; 7) maintain; 8) steam heater; 9) flow diagram; 10) release.

B. 1) зона отстоя; 2) распределительные головки; 3) всасывание; 4) введение; 5) поддерживать; 6) паровой подогреватель; 7) технологическая схема; 8) сбрасывать; 9) промывка; 10) сорт.

3. Find the proper English equivalents (B) for the following Russian terms (A).

A. 1) следы; 2) введение; 3) фильтр; 4) поток; 5) раствор; 6) канализация; 7) давление; 8) пар; 9) обработка; 10) резервуар.

B. 1) stream; 2) steam; 3) traces; 4) solution; 5) drainage system; 6) pressure; 7) injection; 8) strainer; 9) tank; 10) treatment.

4. Find the proper terms for the following definitions.

1) A substance which breaks emulsion into its constituents.
2) A process in which a solid, esp. a metal, is eaten away and changed by a chemical action, as in the oxidation of iron in the presence of water by an electrolytic process.
3) The main part of the electric dehydrating unit.

1) Corrosion.
2) Demulsifier.
3) Electric dehydrator.

5. Translate and memorize the following words and their derivatives (for reference see Appendix 1).

inject – injection – injector – injected

distribute – distribution – distributor – distributorship – distributable – distributional – distributive – distributing – distributed

combine (v) – combine (n) – combination – combinative – combinatorial – combined

compose – composer – composition – composite – composing – composed – composedly

contaminate – contamination – contaminant – contaminated - contaminating

treat (v) – treat (n) – treatment – treatable – treatability – treated

Text 2

FLOW DIAGRAM OF ELECTRIC DESALTING UNIT

The flow diagram of an electric desalting unit acting in three stages bases on the following.

Crude oil flows along pipes from the storage tanks to the suction side of a crude pump, which delivers it through strainers into a heat exchanger group.

In the latter the crude is heated to 60 °C or 70 °C by the utilization of the heat contained in the desalted crude.

From the heat exchangers the crude continues its flow into steam heaters, where its temperature is raised to 110 °C or 115 °C on account of steam.

Provisions are made for injection of water into the crude stream after the heaters, if necessary. Not only water but also demulsifying agent can be introduced in the above points.

The crude oil, water, and demulsifier mixture leaving the heaters is directed into horizontal settling tanks where part of the water with salts dissolved in it and most of the sediments fall out. The crude, having partly rejected its water and sediment in the settlers, flows then into a line where a caustic solution and, if necessary, hot water and demulsifier are added to it. The caustic is delivered in the required proportion by a controlled-volume feed pump.

Now the crude mixed with water, caustic, and demulsifying agent enters the spherical dehydrating tank through three distribution heads opening into clearances between electrode pairs.

The crude stream passing between the electrodes is subjected to the effect of a high-potential electrostatic field after which it enters a precipitation space.

The water with the salts dissolved in it settles at the tank bottom, whereafter it is released into the drainage system.

A pressure within 5 and 6 kg per sq. cm and a temperature about 112 °C are maintained in the electric dehydrating tank.

A pipe transfers the partly desalted and dehydrated crude accumulating in the top portion of the sphere into the second electric dehydrating tank. Fresh hot water and, if necessary, caustic solution and demulsifier are injected into the transfer pipe. The finally dehydrated and desalted crude leaving the secondary dehydrating tank passes through heat exchangers and coolers into a purified crude storage tank.

The capacity of the desalting unit of the recommended type is 2 million tons per year.

So, for instance, if the crude to be treated contains about 2000 mg of salt per litre and about 3 per cent of water, the desalting process will reduce the salt content to 10 or 30 mg per litre and the water content to 0.2 per cent or less, down to traces.

The water requirements for crude washing reach 10 per cent of the crude quantity handled. About 10 g of 92 per cent caustic solution are required per ton of crude oil. Superior grade demulsifying agents are then necessary in quantities as small as several grammes per ton of crude handled.

EXERCISES

1. Translate Text 2 in written form and make a plan expressing the main idea of each logical part.

2. Memorize the names of equipment used in the text "Electric Desalting Unit", use them in phrases and sentences of your own. Translate your phrases and sentences into Russian.

pump − насос, strainer sets − фильтры, heat exchangers − теплообменники, steam heaters − паровые подогреватели, settling tank − отстойник, electric dehydrating tank − электродегидратор, cooler − холодильник, storage tank − резервуар для хранения.

3. Give synonyms to the following words: application, processing, injection.

4. Use the English-English dictionary and explain the meaning of the following verbs (provide examples with them).

flow, deliver, heat, continue, raise, introduce, direct, fall out, add, enter, subject, settle, inject, pass.

5. Translate the following into English.

1) технологическая схема электрообессоливающей установки; 2) за счет пара; 3) горизонтальные отстойники; 4) электрическое / электростатическое поле; 5) осушительная система, дренаж; 6) резервуары для хранения обессоленной нефти; 7) производительность агрегата / установки.

6. Translate the following sentences into English.

1) Сырая нефть течет по трубопроводу. 2) Она нагревается до определенной температуры. 3) Температура повышается до 100 градусов по Цельсию. 4) Деэмульгатор вводится в жидкость. 5) Раствор каустической соды добавляется в перерабатываемое сырьё в заданном количестве. 6) Смесь поступает в электродегидратор. 7) Поток проходит между электродами.

7. Work in pairs. Student 1 asks Student 2 a question. Student 2 translates and answers it. Then Student 1 translates Student 2's answer. Take turns.

1) What is the crude temperature in steam heaters? 2) What mixture is directed into horizontal settling tanks? 3) What is the caustic delivered by? 4) Where does the water with the salts dissolved in it settle? 5) What pressure and temperature are maintained in the electric dehydrating tank? 6) The capacity of the desalting unit is 2 million tons per year, isn't it? 7) Is 10 or 15 g of 92 per cent caustic solution required per ton of crude oil?

UNIT 2

PRE-TEXT ACTIVITIES

1. Work with the dictionary and the vocabulary in this manual, find the meaning of the words and word combinations given below and memorize them. Pay particular attention to their pronunciation.

yield, fuel, lubricating oil, atmospheric and vacuum crude distillation unit, two stage distillation unit, light distillates, equipment, automatic equipment, run (v), rerun (n), caustic washing, processing section, feed stock, asphaltic residue, caustic treatment outfit, investment cost, heat recovery, manpower, reduction, naphtha, blending stock, reduced crude, conversion, finished lubricating oil grades, intermediate tankage, trouble free operation, value, charge stock, bottom, bottom product.

2. Find the proper Russian equivalents (B) for the following English terms and phrases (A).

A. 1) conversion; 2) charge stock; 3) equipment; 4) manpower; 5) investment cost; 6) heat recovery; 7) rerun; 8) fuel; 9) lubricating oil; 10) asphaltic residue.

B. 1) оборудование; 2) инвестиционные расходы; 3) обслуживающий персонал; 4) гудрон; 5) превращение; 6) смазочное масло; 7) топливо; 8) повторная перегонка; 9) регенерация тепла; 10) загрузка.

3. Find the proper English equivalents (B) for the following Russian terms (A).

A. 1) бензин; 2) дизельное топливо; 3) авиационное топливо; 4) производство; 5) органический синтез; 6) атмосферный; 7) вакуумный; 8) перегонка; 9) стабилизация; 10) экономия.

B. 1) stabilization; 2) vacuum; 3) distillation; 4) economy; 5) production; 6) gasoline; 7) organic synthesis; 8) atmospheric; 9) aviation fuel; 10) diesel fuel.

4. Find the proper terms for the following definitions.

1) Asphaltic residue.	1) The bottom product of atmospheric distillation section.
2) Reduced crude.	2) Petroleum before it has been refined.
3) Primary distillation.	3) The bottom product of vacuum distillation section.
4) Crude (oil).	4) The initial step in all refineries.

5. Provide verbs the following nouns are formed from (for reference see Appendix 1). Translate your verbs into Russian, trying to find as many meanings as you can. Use them in phrases or sentences of your own.

distillation, equipment, rerun, washing, processing, treatment, investment, recovery, reduction, blending, conversion, operation.

Text 1

ATMOSPHERIC AND VACUUM CRUDE DISTILLATION UNIT

Petroleum refineries can be designed with various processing tendencies, such as fuel production, with a yield of automotive, aviation, and diesel fuels, or combination fuel and lube oil production in which lubricating oils are obtained along with fuels. Organic synthesis processes are applied in some refineries, especially in large ones.

Primary distillation of petroleum crudes is the initial step in all refineries, apart from the crude purification process. Such distillation is accomplished in atmospheric and two-stage crude distillation units.

Two-stage distillation units can be applied for various crude types. The process equipment of such units is designed for handling not only ordinary but also highly sulphurous crudes. The total yield of light distillates mounts to within 50 and 53 per cent.

The equipment set applied in the units provides for stabilization and rerun of gasoline, caustic washing of all light products, preparation of the necessary chemical solutions, etc.

The following are the main processing sections of a typical two-stage crude distillation unit:

1. Atmospheric distillation section for primary distillation of crude oil and production of gasoline, naphtha, kerosene, and diesel fuel blending stock. The bottom product is reduced crude.

2. Vacuum distillation section where the reduced crude is subjected to further processing in order to obtain either oil distillates suitable for conversion into finished lubricating oil grades or in a wide fraction used as feed stock for catalytic cracking units. Asphaltic residue is here the bottom product.

3. Stabilization and rerun section for separation of light volatile hydrocarbons and production of finished distillates.

4. Caustic treatment outfit for light distillates.

The above combination of several processes in a single unit permits to cut down the investment cost and to achieve high economy in operation by virtue of heat recovery and utilization of heat exchange, accompanied by bringing down the operating manpower to a minimum and by considerable reduction of intermediate tankage and piping length.

Up-to-date instruments and automatic control equipment are widely used in these distillation units.

It should be borne in mind that reliable and trouble-free operation of these units calls for charge stock containing not more than 50 mg of salt per litre. If the salt content exceeds this value, the crude to be handled should undergo a

pre-refining purification process in special dehydrating and desalting units where it loses its salt, water and sediment, before it is delivered to the two-stage distillation unit.

EXERCISES

1. Translate Text 1 in written form.

2. Understanding words. Refer back to the text "Atmospheric and vacuum crude distillation unit" and find synonyms to the following words. The number in brackets stands for the corresponding paragraph. Translate the words.

1) different (1); 2) trends (1); 3) got (1); 4) used (1); 5) particularly (1); 6) cleaning (2); 7) kinds (3); 8) created (3); 9) usual (3); 10) initial (6); 11) fit (7); 12) broad (7); 13) some (10); 14) allows (10); 15) reduce (10); 16) work (10); 17) application (10); 18) personnel (10); 19) modern (11); 20) it should be remembered (12); 21) comprising (12).

3. Find "false translator's friends" in the text "Atmospheric and vacuum crude distillation unit" and provide their Russian equivalents, taking into account the context.

PRE-TEXT ACTIVITIES

1. Work with the dictionary and the vocabulary in this manual, find the meaning of the words and word combinations given below and memorize them. Pay particular attention to their pronunciation.

sulphur, sulphurous, prevent, hydrochloric, fraction, battery, tower, stripping tower, primary tower, vapour, overhead vapour of the secondary tower, top, coil, submerged coil-type condenser and cooler, reflux, intermediate (circulating) reflux, top (live) reflux, fired tube heater, lower portion, stabilizer, live steam, fluid, side cut, two-stage ejector, non-condensable gases, simple reciprocating pump, preheater, narrow boiling range cut.

2. Find the proper Russian equivalents (B) for the following English terms and phrases (A).

A. 1) condensate; 2) primary products; 3) treating section; 4) stripping; 5) tower top; 6) hydrocarbons; 7) reflux; 8) coil; 9) cooler; 10) high sulphur content.

B. 1) отпарка; 2) углеводороды; 3) высокое содержание серы; 4) орошение; 5) змеевик; 6) холодильник; 7) верхняя часть колонны; 8) первичные продукты; 9) конденсат; 10) очистное отделение.

3. Find the proper English equivalents (B) for the following Russian terms (A).

A. 1) колонна; 2) погон; 3) верхнее орошение; 4) острый пар; 5) часть; 6) конденсатор; 7) подогретое сырье; 8) жидкость; 9) величина; 10) лигроин, нафта.

B. 1) condenser; 2) cut; 3) tower; 4) preheated crude; 5) fluid; 6) value; 7) naphtha; 8) top reflux; 9) live steam; 10) portion.

4. Find the proper terms for the following definitions.

1) Caustic solution.	1) A substance formed by condensation, such as a liquid
2) Condensate.	from a vapour.
3) Reflux.	2) Liquid used to prevent hydrochloric corrosion.
4) Condenser.	3) An apparatus for reducing gases to their liquid or solid form by the abstraction of heat.
	4) A part of the product that returns to the tower to support distillation.

5. Study exercise 1 once again and find words formed by affixation, in particular, by means of prefixes, i.e. affixes which occur before the root of a word (e.g. ***un****real,* ***dis****obey****, over****do, etc.) Explain the meaning of these prefixes and provide more examples with them (for reference see Appendix 1).*

Text 2

SECTIONS OF TWO-STAGE CRUDE DISTILLATION UNIT

ATMOSPHERIC SECTION

A total light distillate yield within 50 and 53 per cent, including motor gasoline, kerosene, and diesel fuel, can be obtained in the atmospheric section from desalted sulphurous crudes.

Special charge pumps deliver the desalted crude in two parallel streams into a heat exchanger battery. Caustic solution is injected into the charge pump suction line to prevent hydrochloric corrosion. The heat exchangers preheat the crude to 200 °C or 220 °C.

It can be seen from the crude distillation unit flow diagram that the preheated crude flows in a single stream into the primary (gasoline) tower where it loses its light fractions. The vapour leaving the tower top with a temperature of 102 °C is directed into a submerged coil-type condenser and cooler, whereafter it arrives in a rundown tank.

Part of this product returns into the primary tower as a reflux.

The bottom product of the primary tower, having a temperature of 200 °C, is pumped in two parallel streams into the atmospheric fired tube heater where its temperature is brought up to 320 °C. Then it is directed into the lower portion of a secondary tower.

Part of the hot oil returns to the primary tower to maintain there the required temperature. The overhead vapour of the secondary tower passes a submerged coil-type condenser and cooler after which it is delivered into a rundown tank. A pump returns some of the overhead condensate into the secondary tower top as a reflux fluid. The remainder flows into the stabilization section of the unit. Intermediate (circulating) reflux is also used in the secondary tower apart from the top (live) reflux.

Three side streams are obtained from the secondary tower through a three-sectional stripping tower. Live steam is here used for stripping the bottoms and side cuts of lighter hydrocarbons.

The bottom product of the secondary tower, which has a temperature of 310 °C, is pumped in two streams through the fired tube heater of the vacuum section, whereafter it continues its flow into the vacuum tower.

The side streams of the second tower, having passed the three sections of the stripping tower, run first through heat exchangers, then through cooling coils, into the treating section tanks to be washed with caustic.

VACUUM SECTION

Four lube oil fractions can be obtained in the unit from the secondary fractionating tower bottoms (reduced crude). About 28-30 per cent of the crude charge leave the distillation section in the form of residuum. A wide boiling range fraction can be obtained, if desired, which can be effectively used as feed stock for catalytic cracking units. It can be seen from the flow diagram that secondary tower bottoms are pumped in two parallel streams through the fired heater, where their temperature is raised to 420 °C after which they enter the vacuum tower. A vacuum of 60 mm mercury absolute is maintained here. A constant temperature of 385 °C is kept at the tower bottom, and 125 °C at the top. Steam is supplied into the tower bottom end. Overhead pipes conduct the steam, decomposition gases, air, and small quantities of petroleum vapours into the barometric condenser.

Two-stage ejectors remove the non-condensable gases from the barometric condenser.

Side streams produced in the vacuum tower, if the unit is set up for lube oil processing, leave the tower and are sent through heat exchangers and condensing and cooling coils to tanks.

The vacuum tower product (heavy residuum) is sent through a heat exchanger and cooler into the tankage by a simple reciprocating pump.

STABILIZATION AND GASOLINE RERUN SECTION

To produce finished gasoline, the overhead distillate of the primary fractionating tower is pumped into a stabilizer working under a pressure of 10 kg per sq. cm. The stabilizer bottom temperature (160 °C) required for stabilization process is maintained by means of a preheater in which the product is heated by steam. Stabilized gasoline leaving the preheater flows through heat exchangers and through a cooler to the caustic treatment section, whereafter it is directed into the finished product storage tanks.

The stabilizer overhead vapours are condensed and cooled in tubular condensers and coolers, respectively, and land in a rundown tank, from which some of the liquid product is used for reflux purposes, the remainder being collected in liquid petroleum gas storage tanks.

If narrow boiling range cuts are to be produced, the stabilizer bottoms can be rerun in a special small fractionating tower.

Caustic treatment of the distillation products is effected in horizontal settling tanks designed to work under pressure. An injector is used for circulation of the caustic. The caustic content in the tanks may be brought up to 30 per cent of the total tank volume.

EXERCISES

1. Translate text 2 in written form.

2. Translate the following sentences into English.

1) Раствор щелочи вводят в приемную линию сырьевых насосов с целью предотвращения коррозии. 2) Пары направляются в конденсатор-холодильник погружного типа при температуре 102 °С. 3) Нижний продукт поступает в трубчатый подогреватель. 4) Помимо верхнего (острого) орошения, во второй колонне применяется промежуточное (циркуляционное) орошение. 5) Остаток продукта из второй колонны прокачивается в трубчатый подогреватель вакуумной части установки.

3. Translate the following texts into English.

A. Производительность данной установки, объединяющей несколько процессов, – 6 млн т сырой нефти в год. С точки зрения экономики сочетание нескольких процессов в одной установке позволяет снизить капитальные затраты и достичь высоких экономических показателей эксплуатационной работы за счет регенерации тепла и использования теплообмена. С её помощью можно перерабатывать различные нефти, в том числе высокосернистые. Общий выход легких дистиллятов составляет 50-53 %.

B. Если необходимо переработать тяжелую нефть или получить в результате переработки сырья только ограниченное количество светлых нефтепродуктов (бензина, лигроина, керосина и дизельного топлива) при большой потребности в топливе применяется оборудование для атмосферной перегонки нефти. Такие установки могут производить от 0,5 млн т до 3 млн т сырья в год.

4. Write out the italicized polysemantic words and consult a dictionary for their meaning. What grammar problem of translation can you point out in all the sentences? Translate them into Russian (for reference see Appendix 3).

1) The side *streams* to be washed with caustic run into the treating section. 2) Live steam is used to strip the *bottoms* of light hydrocarbons. 3) The crude to be *handled* should undergo a pre-refining purification process. 4) The settler is *designed* to allow settling time from 20 to 60 minutes. 5) To assure good contact between the water and the crude, they are *passed* through a mixing valve to form an emulsion. 6) The impurities to be removed from the crude *oil* are carried off with water.

UNIT 3

PRE-TEXT ACTIVITIES

1. Work with the dictionary and the vocabulary in this manual, find the meaning of the words and word combinations given below and memorize them. Pay particular attention to their pronunciation.

boiler fuel oil, straight-run, low-pressure flash chamber, delayed cracking, submerged tubular condenser, shell-and-tube cooler, aim product, by-product, process conditions, prolonged continuous operation, remainder, gas plant, octane number, T. E. L., motor method, installation cost, high efficiency electrically driven centrifugal pumps, piping length, convection coils, fractionating column, deethanizer, dry gas, unit boundaries.

2. Find the proper Russian equivalents (B) for the following English terms and phrases (A).

A. 1) thermal process; 2) flow transmitter; 3) servicing; 4) preheater; 5) reciprocating pump; 6) hot-residuum heat exchanger; 7) heavy oil heater; 8) straight-run residuum; 9) shell-and-tube cooler; 10) gas plant.

B. 1) подогреватель; 2) обслуживание; 3) термический процесс; 4) расходомер-датчик; 5) газовый блок; 6) остаток прямой перегонки; 7) поршневой насос; 8) теплообменник горячего остатка; 9) печь тяжелого сырья; 10) кожухотрубный охладитель.

3. Find the proper English equivalents (B) for the following Russian terms (A).

A. 1) протяженность трубопроводов; 2) замедленный крекинг; 3) режим (обработки); 4) испаритель; 5) побочный продукт; 6) котельное топливо; 7) октановое число; 8) ректификационная колонна; 9) абсорбер; 10) погружной трубный конденсатор.

B. 1) boiler fuel oil; 2) fractionating column; 3) octane number; 4) piping length; 5) process conditions; 6) by-product; 7) flash chamber; 8) absorber; 9) submerged tubular condenser; 10) delayed cracking.

*4. **Odd man out**. Find the word which is different from the others in each row. Say why it is different. Translate all the words.*

1) boiler, condenser, cooler, condition, chamber.
2) delayed, driven, fractionating, submerged, prolonged.
3) fuel, straight, low, tubular, dry.
4) electrically, gas, unit, cost, operation.

Text

THERMAL CRACKING

Thermal cracking process is intended for handling heavy charge stock with a view to obtain motor gasoline, tractor kerosene and boiler fuel oil. Straight-run residuum as well as rerun bottoms can here be applied as charge stock.

Motor gasoline is the aim product of the thermal cracking process. Dry fuel gas and reflux are obtained as by-products.

The cracking residuum finds its application as boiler fuel stock.

Various yields can be achieved depending on the charge type and process conditions. Given below is a typical balance for cracking of atmospheric and vacuum residuum from sulfurous crude.

Crude stock	Vacuum residuum, 28 to 30 % of crude, %	Atmospheric residuum 50 % of crude, %
Gasoline reflux…….	17	28
Gas losses…….	8	10
Cracking residuum (fuel oil)……	75	62
Octane number, without T.E.L. addition, motor method……	70 to 72	65 to 67

Thermal cracking units are designed for handling sulphurous as well as nonsulphurous residuums. Its design ensures prolonged continuous operation.

The gas plant, including absorption, deethanizing and gasoline stabilization, is a section of the complete cracking unit. Such a combination process, effected in a single unit, considerably reduces the installation cost by saving intermediate tankage and piping length. It also permits to achieve high economy in operation by virtue of heat regeneration and by cutting down the operating manpower required.

High efficiency, electrically driven centrifugal pumps are applied in these units.

Charge stock is drawn from the feed tanks and pumped through hot-residuum heat exchangers and fired heater convection coils into a fractionating column. A side-stream of the charge extracted after the heat exchangers is directed into a low pressure flash chamber where it is mixed with the fractionating column bottoms to be fed into the heavy oil heater by a charge pump. Another charge pump draws a gas oil fraction from the fractionating column middle and feeds it into a light oil heater. From the latter the products of the cracking process flow into a reaction chamber for delayed cracking, after which they are transferred into a second column, being a high-pressure flash chamber. Light fractions are here separated from the cracking residuum and leave high-pressure evaporator at the top to enter the fractionating column. Light distillates and reflux delivered to the fractionating column top pass then consecutively a sectional condenser and tubular after-coolers to reach a gas separator. The cracking residuum flowing from the high-pressure flash chamber bottom runs without the help of a pump into the low-pressure flash chamber, where it loses its remainder of light fractions. A hot-residuum pump delivers then the cracking residuum through heat exchangers and cooler coils into a tank.

A pump recirculates some of the gasoline from the gas separator as a reflux stream into the fractionating column. The remaining gasoline is directed into the absorber and deethanizer or into the stabilizer column.

The kerosene and naphtha cuts leaving the low-pressure flash chamber top pass a submerged tubular condenser. After this, part of the condensate returns as a reflux into the low-pressure flash chamber. The remainder is delivered into the fractionating column.

Non-stabilized gasoline accumulating in the gas separator is pumped into the absorber and deethanizer, whereafter the deethanized gasoline enters the stabilizer. Having there undergone a stabilization process, the gasoline flows through shell-and-tube coolers into the caustic wash section, after which it is transferred to the finished gasoline tanks.

Gases liberated in the gas separator are sent into the absorber and deethanizer and then into a secondary absorber where light hydrocarbons are removed by means of absorption by naphtha and kerosene cuts. Dry gas coming from the secondary absorber is transferred beyond the unit boundaries.

EXERCISES

1. Translate the text in written form.

2. Work in pairs. Student 1 asks Student 2 a question. Student 2 translates and answers it. Then Student 1 translates Student 2's answer. Take turns.

1) What is the purpose of thermal cracking? 2) Straight-run residuum can be applied as charge stock in this process, can't it? 3) Is the aim product of the thermal cracking process motor gasoline or dry fuel gas? 4) What does the yield of the process depend on? 5) High efficiency, electrically driven centrifugal pumps are applied in these units, aren't they? 6) Are thermal cracking units designed for handling sulphurous or nonsulphurous residuums? 7) How can high economy in operation be achieved?

3. Give antonyms to the following words (for reference see the text "Thermal cracking").

curved, wet, alike, above, nonsulphurous, shortened, double, increases, wasting, cold, high, light, the former, joined, bottom, leave, gains.

4. Translate the following verbs with prefix **re-**.

reuse, rerun, remove, re-equip, reproduce, re-count, re-design, re-do, re-establish, re-examine, re(-)silver, re-sort

5. Translate the following text into English, using the active vocabulary of Unit 3.

На установках термического крекинга используемое оборудование включает печь тяжелого сырья, холодильник крекинг-остатка, теплообменники крекинг-остатка, реакционную камеру, испаритель высокого давления, ректификационную колонну и т.д. При первичной перегонке нефти происходит простое физическое разделение углеводородов, при термическом крекинге происходит термическое превращение углеводородов. Термический крекинг предназначен для получения бензина с высоким октановым числом из более тяжелых видов сырья. Также в процессе термического крекинга получают газ и крекинг-остаток.

6. Translate the following sentences in written form. Pay particular attention to the underlined grammar constructions (for reference see Appendix 3). What are they?

1) Visbreaking is known to be a milder version of thermal cracking. 2) The process is said to be replaced by catalytic cracking. 3) The reaction is considered to cause reduction in boiling point. 4) This kind of pumps has long been known to be applied in cracking units.

7. Translate the following text into Russian.

THERMAL CRACKING

Usually the term *thermal cracking* applies to an overall cracking caused by elevated temperature wherein the heavy oils are converted to lighter ones. A milder version, called *visbreaking*, causes very little reduction in boiling point, yet alters significantly the viscosity of the feed. Severe cracking is employed in the coking processes. These two extreme forms of cracking are being constructed to produce more feedstock for catalytic cracking or other downstream processes.

UNIT 4

PRE-TEXT ACTIVITIES

1. Work with the dictionary and the vocabulary in this manual, find the meaning of the words and word combinations given below and memorize them. Pay particular attention to their pronunciation.

catalytic, moving bead catalyst, powder-type catalyst, alkylation, diesel fuel blending stock, hydrofining, turboblower, butylene, reactor, separate (v), superheated steam, feed hopper, restore (regenerate), gas oil, isobutene, coke burning, combustion gases, rich gas, gas fractionating plant, draw off, compressor, recirculate, storage tank area, excessive heat, device, gas lift.

2. Find the proper Russian equivalents (B) for the following English terms and phrases (A).

A. 1) high quality gasoline; 2) turboblower; 3) excessive heat; 4) powder-type catalyst; 5) gas oil; 6) combustion gases; 7) feed hopper; 8) diesel fuel blending stock; 9) rich gas; 10) storage tank area.

B. 1) компонент смешения дизельного топлива; 2) парк; 3) загрузочная воронка; 4) турбовоздуходувка; 5) богатый газ; 6) избыточное тепло; 7) пылевидный катализатор; 8) высококачественный бензин; 9) газойль; 10) газообразные продукты сгорания.

3. Find the proper English equivalents (B) for the following Russian terms (A).

A. 1) компрессор; 2) прибор; 3) газофракционирующая установка; 4) алкилирование; 5) регенератор; 6) выжиг кокса; 7) перегретый пар; 8) паровая фаза; 9) реактор; 10) движущийся катализатор.

B. 1) coke burning; 2) moving catalyst; 3) superheated steam; 4. vapour phase; 5) reactor; 6) gas fractionating plant; 7) regenerator; 8) alkylation; 9) compressor; 10) device.

4. Find the proper definition.

1) Cracking.	1) Treatment with hydrogen.
2) Hydrofining.	2) A vessel, esp. one in industrial use, in which a chemical
3) Coke burning.	reaction takes place.
4) Reactor.	3) A process of removing coke from catalyst.
	4) The oil-refining process in which heavy oils are broken down into hydrocarbons of lower molecular weight by heat or catalysis.

5. Study exercise 1 once again and find words formed by affixation, in particular, by means of prefixes, i.e. affixes which occur before the root of a word (e.g. ***in****put,* ***mis****use,* ***un****usual, etc.) Explain the meaning of these prefixes and provide more examples with them (for reference see Appendix 1).*

Text

CATALYTIC CRACKING

Catalytic cracking units, with moving bead catalyst as well as with powder-type catalyst, are used in Russia for production of high grade gasoline and for increasing the total yield of fuel distillates. Various straight-run petroleum fractions as well as secondary process products can be applied as charge stock. The catalytic cracking products are: high quality gasoline grades and by-products as catalytic gas oil and gases with high content of isobutane applied as feed for alkylation units.

Light catalytic gas oil grades can be used as diesel fuel blending stock, direct or after hydrofining.

Catalytic cracking units are built for various capacities. Their equipment permits continuous processing of sulfurous as well as sulphur-free stock.

High-efficiency centrifugal pumps and turboblowers are used in these units. Up-to-date instruments and automatic control equipment are applied, with electric and pneumatic operating mechanisms.

Given below is a typical yield table with vacuum distillate (350 °C to 500 °C cut) from sulfurous crude as charge stock for a single-stage process:

automotive gasoline..... 33 %
butane-butylene..... 8,6 %
gases..... 8 %
light gas oil (diesel fuel component)..... 24,4 %
heavy gas oil (fraction above 350 °C)..... 20 %
coke + losses..... 6 %

The charging stock entering the unit is directed by means of a centrifugal pump into heat exchangers and then into a fired heater. There it is brought up to

the required temperature and, having been converted into vapour phase, continues its way to a reactor in which it comes into contact with the moving catalyst.

A special device in the reactor separates the vapours and the gaseous products from the moving catalyst. Thereafter they are directed into the fractionating column.

The catalyst covered with coke is stripped with superheated steam. A gas lift using hot combustion gases raises it then from the reactor bottom into a feed hopper, whence it enters a regenerator. In the latter the coke covering the catalyst surface is burnt off, and the catalyst activity is thereby restored. The regenerated catalyst is transferred into the reactor for reuse.

Hot air is continually blown into the regenerator for coke burning. The air is preheated in special air heaters. Excessive heat developed in the regenerator by the coke burning process is utilized for generation of high-pressure steam.

Fresh catalyst is added into the system from time to time to make up losses. Combustion gases are utilized for preheating this catalyst. Petroleum product vapours and gases leaving the reactor section enter a fractionating section to be separated into individual fractions. Gasoline vapours and gases having passed the fractionating column and a condenser-and-cooler set, reach a gas separator. Rich gas flows then into the compressor suction line of the gas fractionating plant.

The gasoline partly returns into the fractionating column as a reflux. The remainder is pumped into the stabilizing plant.

The intermediate fraction, being a light gas oil, passes the fractionating column, heat exchangers, and a condenser. Then it partly recirculates into the cracking charge, the remainder being pumped away from the unit.

Heavy gas oil flows through heat exchangers to be partly returned into the fractionating column with a view to maintain the required temperature at the column bottom and to be partly drawn off through a cooler and sent to the storage tank area.

EXERCISES

1. Translate the text in written form.

2. Work in pairs. Student 1 asks Student 2 a question. Student 2 translates and answers it. Then Student 1 translates Student 2's answer. Take turns.

1) What are the catalytic cracking units used for? 2) What is the charge stock for the catalytic cracking process? 3) What pump is used to direct the charging stock into heat exchangers? 4) The catalyst covered with coke is stripped with superheated steam, isn't it? 5) Where is the coke burnt off? 6) Is hot or cold air blown into the regenerator for coke burning? 7) What gases are utilized for preheating the catalyst? 8) What does heavy gas oil flow through heat exchangers for?

3. Translate into Russian the following nouns with suffix **–(t)ion / –sion**.

protection, variation, application, separation, provision, determination, connection, concentration, fractionation, alkylation, separation, division, determination, obligation, suggestion, supervision, desalination, elimination

4. Translate into English.

Целью процесса каталитического крекинга является получение высокооктанового бензина. В отличие от термического крекинга в этом процессе применяется катализатор. Катализатор может быть гранулированным и пылевидным. Существуют установки с применением подвижного гранулированного катализатора и установки с пылевидным катализатором. В этом случае катализатор находится в кипящем слое. В процессе крекинга на катализаторе откладывается кокс. Для восстановления активности катализатора в регенераторе производится выжиг кокса.

5. a) Name the underlined grammar phenomena in the following sentences and state their functions (for reference see Appendix 3).

b) Find attributive clusters (groups of words with a key noun and a number of attributive components modifying it) with attributes expressed by a noun.

c) Translate the sentences in written form.

1) Having been heated, the crude oil is directed to the settling tank. 2) The desalted crude leaving the dehydrating tank passes through heat exchangers and coolers into storage tanks. 3) Having partly rejected its water and sediment, the crude flows into a line where a caustic solution is added to it. 4) The heated residue is introduced into a drum, the residence time being sufficient for coke to form. 5) The thermofor catalytic cracking process is a continuous catalytic cracking process with a moving bead type operation having one chamber for the reaction and another for regenerating the catalyst. 6) A varying amount of product is obtained depending on charge stock and process conditions. 7) Catalyst make-up rates being very low, regeneration facilities are unnecessary. 8) The charge being cracked under mild conditions, coke formation is minimized. 9) Having passed through heat exchangers, the crude oil enters the steam heater. 10) The process is carried out at elevated temperatures, the temperature depending upon the type of crude being processed. 11) The heat lowers the surface tension of the oil allowing water particles to coagulate easier. 12) The heat reduces the viscosity of the oil giving less resistance to separation of the salt water.

UNIT 5

PRE-TEXT ACTIVITIES

1. Work with the dictionary and the vocabulary in this manual, find the meaning of the words and word combinations given below and memorize them. Pay particular attention to their pronunciation.

reforming, reformate, benzene, xylene, octane number (research method, clear), Reid vapour pressure (RVP), liquefied gas, throttle (v), withdraw, effluent, independent circuit, overhead distillate, blend, meet market requirements, mm mercury, layout, pump-and-compressor house, monomethanol amine, hydrogen sulphide, scrubbing, hydrogenizate, liquid phase, aluminum-cobalt-molybdenum catalyst, heat-absorbing process, reboiler, send away.

2. Find the proper Russian equivalents (B) for the following English terms and phrases (A).

A. 1) scrubbing; 2) layout; 3) effluent; 4) overhead distillate; 5) cobalt; 6) hydrogen sulphide; 7) benzene; 8) reformate; 9) mercury; 10) reboiler.

B. 1) бензол; 2) расположение; 3) промывка; 4) вытекающий поток; 5) верхний продукт; 6) сероводород; 7) ртуть; 8) подогреватель; 9) кобальт; 10) продукт реформинга.

3. Study these words and find synonymous pairs.

A. 1) cut; 2) blend; 3) withdraw; 4) obtain; 5) unrefined oil; 6) scrubbing; 7) cut down; 8) equipment; 9) convert; 10) apply.

B. 1) crude oil; 2) produce; 3) mix; 4) washing; 5) bring down; 6) fraction; 7) remove; 8) employ; 9) outfit; 10) transform.

4. Study these words and find pairs of antonyms.

emit, low, rise, rich, heat, narrow, bottom, include, poor, curved, high, top, final, fall, exclude, initial, wide, cool, straight, absorb

5. Find the proper definitions.

1) Catalyst.	1) A process of removing sulphur.
2) Desulphurization.	2) A substance that increases the rate of a chemical reaction without itself suffering any permanent chemical change.
3) Regeneration of catalyst.	3) A process of burning out the coke deposited on the catalyst.

Text

CATALYTIC REFORMING UNIT

The purpose of the catalytic reforming process is to convert low-octane naphtha cuts into high-octane gasoline and to produce aromatic hydrocarbons required as raw material for the chemical industry.

The charge stock can consist either of straight-run naphtha or of cracking naphtha (with low as well as with high sulphur content).

Narrow boiling-range fractions are used as feed for production of aromatic hydrocarbons.

No treatment of the reformate is required if motor gasoline is the final product. It must only be stabilized before it is blended with finished straight-run gasoline. The motor gasoline component obtained in this process has an octane number varying within 86 and 98 (research method, clear).

If the process is conducted so as to produce aromatic hydrocarbons, the reforming products will contain higher percentages of benzene, xylene and other aromatics in quantities depending on the feed stock handled and on the process conditions.

The following products can be obtained in this process: high-octane motor gasoline blending stock, overhead distillate, hydrocarbon gases, hydrogen-rich gas.

After the catalysate has been stabilized, the motor fuel blending stock can be put out with a Reid vapour pressure varying within 150 and 500 mm mercury, to meet the market requirements.

From the standpoint of process service and layout, the catalytic reforming unit can be regarded as comprised of three sections, namely: hydrodesulphurization section, reforming section, and pump-and-compressor house.

In case any other hydrofining units are provided in the refinery for purification of sulphurous distillates, the hydrogen-rich gas can be utilized as feed for such units, after it has been cleaned of hydrogen sulphide by means of a monomethanol amine solution.

A simplified flow diagram of the catalytic reforming unit incorporating pre-hydrofining of charge stock, illustrates the main equipment types and processing techniques used.

The charge mixed with hydrogen-rich gas is heated first by exchange, then in a fired heater. Having attained the temperature required for the reaction (380 °C to 410 °C), it enters the hydrodesulphurization reactor.

A combination aluminium-cobalt-molybdenum catalyst is used for this operation.

The reaction products leaving the desulphurization reactor are heated in reheaters and directed into a stripper. The gases and vapours flowing from the latter are cooled down and condensed, respectively.

The liquid phase (hydrogenizate) is pumped back into the stripper top. The remainder of the hydrogenization products is extracted from the hydrogen-rich gas by scrubbing with an absorbent in an absorber. The absorbing fluid used here is a reduced charge fraction, which can be mixed with a primary charge and returned into the process after the hydrogenizate has been removed from it.

The stabilized hydrogenizate running from the stripper bottom is mixed with the circulating gas. Then it is reheated in exchangers and in a fired heater after which it enters the first reactor of the set with a temperature within 495 °C and 525 °C. Alumina-platinum catalyst is used in the catalytic reforming process.

The aromatization process is heat absorbing. For this reason reheating of the material is provided on the way from one reactor into another. This is performed in the second and third coils of the fired heater.

After the third reactor the reaction products partly leave their heat for utilization in the stabilizer reboilers and heat exchangers. Then they are cooled down to 30 °C or 35 °C and flow into a high-pressure gas separator.

In the latter the gas-and-liquid mixture is divided into individual phases. Most of the gaseous phase (circulating gas) is drawn off by a circulation compressor to return with a pressure of 54 kg per sq. cm into the reforming section where it is mixed with the hydrogenizate.

The remaining gas produced in the separator is sent to the hydrofining section. The liquid effluent of the 1st stage gas separator is directed into the second stage gas separator in which hydrocarbon gases are developed.

A pressure within 14 and 18 kg per sq. cm (gauge) is maintained in the 2nd stage separator, the exact value depending on catalysate stabilization process condition required for production of stabilized gasoline with a Reid vapour pressure within 500 and 150 mm mercury. In case of depropanization (i. e. with 500 mm RVP gasoline as a product) the non-stabilized gasoline is drawn from the separator by a centrifugal pump and passes with an initial pressure of 29 kg per sq. cm through a heat exchanger set. Here its temperature rises to 200 °C on account of the hot stream of stabilized gasoline coming from the column.

In case of debutanization (i.e. production of 150 mm RVP gasoline) the non-stabilized gasoline flows apart from the pump and enters the heat exchangers with a pressure of 18 kg per sq. cm, to be likewise heated up to 200 °C.

The necessary temperature is maintained in the stabilized bottom on account of reheating the circulating stabilized gasoline in a heater supplied with heat by the hot flow of reaction products leaving the reactor section.

The overhead fraction of the stabilizer column flows through a condenser and cooler into a rundown tank, whence part of the liquefied gas returns as reflux, to the column, while the remainder is sent away from the unit.

The hydrocarbon gas developed in the tank is throttled and withdrawn from the unit together with the gas coming from the 2nd stage separator.

The stabilized gasoline flowing from the column passes a heat exchanger and a cooler and leaves the unit as a finished product with a temperature of about 35 ^{o}C.

A catalyst regeneration operation is carried out once in six months to keep up high product yields and qualities. The regeneration process of the aluminium-cobalt-molybdenum catalyst consists in burning out the coke deposited on the catalyst in the course of the reaction process.

Catalysts of the hydrofining and reforming sections are regenerated simultaneously but in independent circuits.

EXERCISES

1. Translate the text in written form.

2. Work in pairs. Student 1 asks Student 2 a question. Student 2 translates and answers it. Then Student 1 translates Student 2's answer. Take turns.

1) What is the catalytic reforming process intended for? 2) What can the charge stock consist of? 3) Where is the charge mixed with hydrogen-rich gas heated? 4) A pressure within 14 and 18 kg per sq. cm (gauge) is maintained in the 2nd stage separator, isn't it? 5) Is a catalyst regeneration operation carried out once in six or seven months? 6) How many sections are there in the catalytic reforming unit? 7) High-octane motor gasoline blending stock can be obtained in this process, can't it?

3. Translate the following text into English.

В процессе каталитического реформинга водород используют для подавления коксообразований на катализаторе. Необходимость очистки исходного сырья от сернистых соединений зависит от количества серы в сырье и типа применяемого катализатора. Применяются, в основном, алюмо-кобальт-молибденовый и алюмо-платиновый катализаторы.

4. a) Name the underlined grammar phenomena in the following sentences and state their functions (for reference see Appendix 3).

b) Translate the sentences in written form.

1) On <u>being heated</u> these salts decompose. 2) Before <u>being sent</u> to refining the crude oil was dehydrated and desalted. 3) This apparatus is used for <u>recording</u> the pressure. 4) Without <u>being subjected</u> to special treatment this catalyst cannot be used in this process. 5) Most up-to-date instruments and automatic control devices for controlling various <u>refining</u> processes are widely used in our refineries. 6) <u>Passing</u> alcohol and carbon disulfide vapours over catalysts at

400 °C gives a moderate yield of mercaptan. 7) Carrying out this reaction was hindered by the presence of admixtures. 8) The process of separating a mixture of liquids into fractions which differ in their boiling points is called fractional distillation.

5. a) Write out the italicized polysemantic words and consult a dictionary for their meaning.

b) Translate the sentences into Russian, analyzing −ing *forms (for reference see Appendix 3).*

1) The processing *units* being equipped with *control* instruments, the *number* of operating personnel can be reduced to a minimum. 2) There is no hope of our getting high *yields* in the near future. 3) The admixtures remaining in the end *product* were distilled off. 4) The above formula is for a *column* operating under total reflux, that is, with no distillate being removed. 5) Very little additional polymerization *capacity* is expected to be installed for the future, the process having given way to alkylation for motor fuel *production*.

UNIT 6

PRE-TEXT ACTIVITIES

1. Work with the dictionary and the vocabulary in this manual, find the meaning of the words and word combinations given below and memorize them. Pay particular attention to their pronunciation.

solvent, wax, solubility, volatility, solvent dewaxing, pour point, recover, carbon residue, decomposition, poison, severe conditions, removal, contaminants, lead susceptibility, gum, impurity, virgin, barrel, waste, promote, acid sludge, LPG (liquefied petroleum gas), sweetening, oxo alcohols, aldehydes, primary variables, benzene ring, sweating, hydrogenation.

2. Find the proper Russian equivalents (B) for the following English terms and phrases (A).

A. 1) solubility; 2) volatility; 3) dewaxing; 4) decomposition; 5) contaminate; 6) remove; 7) recover; 8) poison; 9) sweetening; 10) acid sludge.

B. 1) очистка от активной серы; 2) извлекать; 3) летучесть; 4) растворимость; 5) удалять; 6) отравлять; 7) кислый гудрон; 8) разложение; 9) депарафинизация; 10) загрязнять.

3. Find the proper English equivalents (B) for the following Russian terms (A).

A. 1) кислота; 2) коксовое число; 3) температура застывания; 4) чувствительность к ТЭС; 5) параметры процесса; 6) депарафинизация растворителями; 7) смолообразующие соединения; 8) меркаптаны; 9) продукт прямой гонки; 10) глубина гидрирования.

B. 1) solvent dewaxing; 2) pour point; 3) gum-forming compounds; 4) mercaptans; 5) rate of hydrogenation; 6) virgin product; 7) carbon residue; 8) acid; 9) lead susceptibility; 10) process variables.

4. Find the proper definition.

1) Dewaxing.	1) A treatment of gasoline for removing active sulphur.
2) Sweetening.	2) A liquid capable of dissolving another substance.
3) Solvent.	3) A process of removing wax.

5. Translate and memorize the following words and their derivatives (for reference see Appendix 1).

solve – dissolve – solution – soluble – insoluble – solubility

cover – recover – recoverable – recovered – recovery

compose – decompose – composition – decomposition – composed – composedly – composing

contaminate – contamination – contaminant – contaminated – contaminating

susceptible – susceptibility – susceptive

pure – impure – purity – impurity – purification – purify – purificatory – purifier – purifying – purified

waste – wastage – wasted – wasteful – wastefulness – wasteland

promote – promoter – promotion – promotional

vary – variable – variance – variant – invariant – variation – varied – variety – various – variously

*6. **Odd man out**. Find the word which is different from the others in each row. Say why it is different. Translate all the words.*

1) solubility, poison, volatility, susceptibility, impurity.

2) barrel, decomposition, condition, hydrogenation, ignition.

3) recover, remove, liquefied, waste, promote.

4) wax, point, poison, residue, severe.

Text

SOLVENT REFINING, HYDROTREATING AND OTHER TREATING

Some processes are essential to petroleum refining although they can seem to have an accessory to the basic scheme of converting crude oils into fuels, lubricants, waxes and asphalts. Among these processes are the ones included in the categories of solvent refining, hydrotreating and other treating processes. These are used to make feed stocks more suitable for processing and to improve product quality. As quality requirements become more stringent, investment in equipment and efforts devoted to operating and maintaining such processes reach sizable proportions.

SOLVENT REFINING

Solvent refining methods are used primarily to manufacture lube oil fractions or to prepare feed stocks for catalytic cracking. By these methods hydrocarbon mixtures are separated on the basis of their relative solubilities without specific regard to volatility. The processes are physical in nature, the chemical character of the various hydrocarbons remaining unchanged. In lubricant manufacturing the good properties of paraffinic materials are sought. The development of solvent processes has to a large extent eliminated the sharp distinction once made between different crudes on the basis of their suitability for lubricating oil manufacture. Now the undesirable aromatics may be removed so that the crude oils can be evaluated on the basis of the amount of lubricating oil of specified quality which they will yield. The waxes in the lube oil stocks are separated to produce finished lubricants with low pour points and also to recover wax either as a salable product or as stock for further processing. Solvent dewaxing is favoured over the older methods involving "sweating".

Low carbon residue is desirable in feed stock charged to catalytic cracking units. Here solvent refining competes with other feed preparation processes, such as vacuum distillation, visbreaking, coking, etc. Solvent refining which accomplishes deasphalting avoids high temperatures that lead to thermal decomposition of the feed stock.

HYDROTREATING

Many factors are spurring hydrotreating processes into existence. Even though the technique was known for some time, its practice was limited until the appearance of a ready supply of by-product hydrogen from catalytic reforming.

Hydrotreating in turn offers an excellent feed pretreatment for catalytic reforming. The treatment reduces the content of materials which would otherwise poison the reforming catalyst.

Platinum catalysts are used in most catalytic reforming processes today because they give superior yield-octane relationship. Nitrogen reportedly decreases the isomerization efficiency of these dual-function catalysts. Sulphur, on the other hand, diminishes the dehydrogenation function of the catalysts. Hydrotreating is of great benefit then because it reduces nitrogen and sulphur as well as other lesser reformer catalyst poisons.

Nitrogen usually requires the most severe hydrotreating conditions for its removal. A process which satisfactorily reduces nitrogen normally qualifies to reduce other contaminants. This explains why recent publications have concentrated upon the nitrogen removing ability of specific hydrotreating processes. The demand for better quality motor fuels is a common incentive for both processes. Reforming gives improvement in the octanes of a motor fuel while hydrotreating contributes to greater cleanliness. Both of these improvements are better appreciated as the refiner is required to use poorer quality crudes to make better quality fuels.

Lead susceptibility of a gasoline is decreased by the presence of sulphur. Hence the removal of sulphur by hydrotreating is worthwhile in the interest of higher octane ratings. Moreover, hydrotreating improves the quality of gasoline by selectively hydrogenating diolefins without affecting the benzene ring. This eliminates the gum forming compounds without wasteful conversion of aromatics to naphthenes.

A whole spectrum of products − from coke to gases − can receive benefit from hydrotreating. The largest single material to be hydrotreated commercially is straight-run naphthas. Middle distillates rank second.

The hydrotreating of gases is practiced during the manufacture of some petrochemicals. For example, in the manufacture of oxo alcohols from aldehydes, the carbon monoxide impurity is converted to methane by hydrogenation. Carried out over a nickel catalyst, the hydrotreating step is called appropriately the mechanization step.

Coke, on the other end of the scale, needs such severe hydrotreating conditions that no practical steps have been taken to use it as a charge stock.

The severity of hydrotreating employed for other grades of products depends upon the feed stock properties and the improvement required. Virgin distillates usually require the least severe treatment. Heavy oils, cracked distillates and waxes take intermediate severity, whereas residuals require the most severe conditions.

The primary variables influencing hydrotreating are hydrogen partial pressure, process temperature and contact time. An increase in hydrogen pressure gives a better removal of undesirable materials and a better rate of hydro-

genation. Thus the hydrogen pressure is made as high as possible, consistent with keeping hydrogen make-up costs reasonable. Excessive temperature increases the formation of coke. The temperature is held then as low as minimum product quality will permit. Contact time is set to give adequate treatment without exceeding the point of excessive hydrogen usage and undue coke formation. In commercial installations the contact time is complicated by the need to get proper exposure of the feed stock to the catalyst.

For the processes compiled here, the pressures range from 100 to 3,000 psig. Temperatures range from less than 350 °F to as high as 850 °F, although most processing is done in the range of 600 °F to 800 °F. Hydrogen recycle rates usually are below 2,000 standard cubic feet per barrel of charge. Actual hydrogen consumption is much below this amount − usually less than 200 s.c.f. per barrel of charge.

OTHER TREATING

Treating processes which do not logically fall into the first two categories are included here. Not included are the treating processes which are used on waste streams of the refinery to make them suitable for disposal. Thus each of the following processes is concerned with rendering some form of improvement to a hydrocarbon stream within a refinery.

Crude desalting is a treating method employed at the very beginning of a crude processing scheme. The large majority of crudes are contaminated with salt water and solids. These contaminants can be reduced greatly by desalting processes.

Caustic washing is a widely used means of treating gasoline products for removal of hydrogen sulphide and mercaptans. Several processes use additional compounds in the caustic solution to promote reaction of the solution with the mercaptans.

Acid washing is relegated to the treatment of some distillates and heavier materials. It not only removes some sulphur compounds but also reacts with gum forming components. The result is a clearer coloured product which has less tendency to form sludge.

Gas treating can be practiced with such processes as Girbitol or Glycol-Amine Gas Treating. They are employed usually to remove sulphur from gases charged to polymerization units, alkylation units or LPG sales outlets.

Solid absorbents as well as liquid chemicals are used by the refiner to improve the quality of the product. Among the processes using absorbents are Percolation Filtration, Continuous Contact Filtration, and Adsorptive Drying and Sweetening.

EXERCISES

1. Translate the text in written form.

2. Work in pairs. Student 1 asks Student 2 a question. Student 2 translates and answers it. Then Student 1 translates Student 2's answer. Take turns.

1) What processes are essential to petroleum refining? 2) What are solvent refining methods based on? 3) What is the purpose of separating the waxes in lube oil stocks? 4) How can you define hydrotreating? 5) Such contaminants as salt water and solids can be reduced greatly by desalting processes, can't they? 6) Is acid washing relegated to the treatment of heavier or lighter materials? 7) What can gas treating be employed for? 8) Why are solid absorbents as well as liquid chemicals used by the refiner?

3. Write a short review on treating processes (for reference see Appendix 6). You may find the phrases below useful.

The text consists of the following items: …; The first item (chapter) is devoted to …; The following chapters (items) deal with …; The bulk of the text concentrates on …; There are some (minor) criticisms to be made. Firstly …; Secondly …; Despite the text's (book's) limitations …; On the whole, the book is …; It may be recommended to / for ….

Translate your review into Russian.

4. Translate the following text into English.

На этом заводе используют экстракционную очистку, гидроочистку и некоторые другие процессы. Методы экстракционной очистки используются для получения фракций смазочных масел. К тому же они применяются для подготовки сырья для установок каталитического крекинга. Помимо экстракционной очистки в процессе подготовки сырья участвуют вакуумная перегонка, легкий крекинг, коксование и т.д. При экстракционной очистке избегают высоких температур, так как в противном случае это ведет к термическому разложению сырья.

5. a) In the following text find words that have common roots with the words given below.

b) Define what parts of speech they refer to and translate them (for reference see Appendix 1).

c) Translate the text.

treat, product, catalyst, efficient, susceptible, remove, contaminate

The source of hydrogen for hydrotreating is a ready supply of by-product hydrogen from catalytic reforming. Hydrotreating reduces the content of materi-

als which would otherwise poison the reforming catalyst. This process reduces nitrogen and sulphur as well as other catalyst poisons. Nitrogen decreases the isomerization efficiency of platinum catalysts. It is necessary that sulphur be reduced too as sulphur diminishes the hydrogenation function of the catalysts. Sulphur decreases lead susceptibility of a gasoline. Hence the removal of sulphur by hydrotreating is worthwhile in the interest of high octane ratings. Nitrogen requires the most severe hydrotreating conditions for its removal. If a process reduces nitrogen, it reduces the other contaminants.

UNIT 7

PRE-TEXT ACTIVITIES

1. Work with the dictionary and the vocabulary in this manual, find the meaning of the words and word combinations given below and memorize them. Pay particular attention to their pronunciation.

economic incentive, upgrade, olefinic, isobutane, petrochemicals, styrene, synthetic rubber, furnish, gasoline pool, lag, acceptance, install, motor octane number, reason, decline, enjoy, alkylation enjoys a robust growth, compare, comparison, route, available, isomer, occur, off-gas, equal, suppress, slight amount, capable, unite, modify, modified, hydrocracker, octane level.

2. Find the proper Russian equivalents (B) for the following English terms and phrases (A).

A. 1) off-gas; 2) economic incentive; 3) hydrocracking; 4) motor octane number; 5) gasoline pool; 6) acceptance; 7) gaseous stock; 8) polymer gasoline; 9) octane level; 10) synthetic rubber.

B. 1) октановое число по моторному методу; 2) компаундированный бензин; 3) полимеризационный бензин; 4) применение; 5) октановое число; 6) газообразное сырье; 7) синтетический каучук; 8) отходящий газ; 9) гидрокрекинг; 10) экономический стимул.

3. Find the proper Russian equivalents (B) for the following English verbs (A).

A. 1) upgrade; 2) install; 3) exhibit; 4) decline; 5) enjoy; 6) compare; 7) lag; 8) furnish; 9) occur; 10) suppress.

B. 1) сравнивать; 2) встречаться; 3) улучшать / повышать качество; 4) подавлять; 5) устанавливать; 6) отставать; 7) проявлять; 8) падать; 9) поставлять; 10) пользоваться.

4. Find synonymous pairs. Translate the words.

A. 1) decline; 2) exhibit; 3) combine; 4) route; 5) sensitive; 6) feed stock; 7) furnish; 8) available; 9) reason; 10) convert.

B. 1) join; 2) show; 3) way; 4) charge stock; 5) decrease; 6) susceptible; 7) transform; 8) applicable; 9) supply; 10) cause.

5. Translate these international words into Russian and memorize their spelling.

1) isobutylene; 2) n-butane; 3) olefin;, 4) ethylene; 5) polymerization; 6) isomer; 7) propylene; 8) atmosphere; 9) isomerization; 10) ethylbenzene.

6. Word building: study exercise 1 once again, find all the verbs and provide as many words with the same root as you can. Translate the words (for reference see Appendix 1).

Text

ALKYLATION, POLYMERIZATION, ISOMERIZATION

ALKYLATION

There is an economic incentive to make gasoline by combining gaseous stocks. Processes which upgrade gaseous stocks are alkylation and polymerization. Both require olefinic light hydrocarbons as feed stock.

The principle of alkylation as it applies to motor fuel production involves the combination of an isoparaffin, usually isobutane, with olefins such as propylene, butylene and amylene. The resulting product is a gasoline component with very desirable stability properties and high octanes.

Alkylation is also used in the production of petrochemicals. For example, benzene and ethylene are combined by alkylation to form ethylbenzene, which, in turn, is used in the formation of styrene and synthetic rubber.

Alkylation gives a better gasoline blending stock than reforming, although alkylation units cost more to build and operate.

POLYMERIZATION

The value of polymerization to furnish a gasoline blending stock depends upon the octane level of the gasoline pool. In some countries where gasoline octanes are lagging, polymerization is still finding acceptance.

Polymer gasoline has a research rating of 95-97 unleaded and exhibits about the same lead susceptibility as catalytically cracked gasoline. Its sensitivity (12-14 octane number) is a little greater than cracked stock. Thus its low mo-

tor octane is of little help to a refiner trying to compete in the present high octane gasoline market.

But octane ratings are not the only reason polymerization is declining while alkylation enjoys a robust growth. This can be seen by comparing the amount of product these two processes make from equal olefin consumption. In polymerization, one barrel of gasoline product requires approximately 1.4 barrels of olefin feed. If this quantity were fed instead to an alkylation unit and combined with isobutane, the volume of product would be almost 2.5 barrels. Thus the alkylation route gives 2.5 times more volume than does polymerization for the same quantity of olefin available.

ISOMERIZATION

Isomerization is another processing technique available for getting higher octane motor fuels. It can be used to convert the light gasoline materials into their higher octane isomers. Another route to higher octanes, though somewhat indirect, is the use of the process to convert normal butane into the isobutane needed for alkylation. The greatest application of isomerization is for the production of isobutane.

Alkylation usually can consume more isobutane than occurs naturally in a refinery stream. For instance, a typical C_4 fraction from a reforming operation is as follows:

Reformer Off-Gas

component	wt %
isobutylene	20
n-butylenes	27
isobutene	18
n-butane	35
total	100

In an alkylation reaction 47 per cent total olefins are capable of uniting with about an equal amount of isobutane, although only 18 per cent is available in the stream. Also, alkylation units are modified to permit the use of more propylene and amylene, even larger quantities of isobutene are needed.

The need for units to isomerize n-butane into isobutane will not be as great in areas where hydrocracker is being installed. When a hydrocracker converts heavy oils into gasoline and distillate, the resulting off-gas is rich in isobutane.VA typical C_4 fraction from hydrocracking catalytic cycle oils is as follows:

Hydrocracker Off-Gas

component	wt%
isobutene	72
n-butane	28
total	100

For a motor fuel, often the light materials in the blend have the lowest octanes. Therefore, isomerization has another way it can do its bit for the octane fight. By converting some of the light materials to their isomers, an increase in octane rating is achieved.

Some refiners do not believe a separate isomerization process is needed to handle the light fractions of gasoline. They suggest the stock be charged along with a normal reforming process. Some isomerization will occur and the loss in reformer product octane is compensated for by the increased quantity of material produced.

The isomerization reaction neither consumes nor produces hydrogen. Nevertheless, the process is carried out in a hydrogen atmosphere. The hydrogen suppresses cracking and hydrogenates any slight amount of cracked materials which may be formed by side reactions to the process.

EXERCISES

1. Translate the text in written form.

2. Write the précis of the text "Alkylation, polymerization, isomerization" in English and translate it into Russian (for reference see Appendix 6).

The following procedure may be of help.

1) Analyze the passage from the point of view of its logical division. Divide the passage into logical units, i.e. into an introduction, principal part and conclusion. Make regroupings, i.e. join several paragraphs if necessary.

2) Suggest titles for each logical unit so that you have a detailed plan of the passage.

3) Develop the titles into topic sentences. Join the topic sentences into entity. The précis should not exceed one third of the passage.

4) Translate your précis into Russian.

3. Work in pairs. Student 1 asks Student 2 a question. Student 2 translates and answers it. Then Student 1 translates Student 2's answer. Take turns.

1) How many processes upgrade gaseous stock? What are they? 2) What feed stock is required for the alkylation process? 3) Alkylation isn't used in the production of petrochemicals, is it? 4) Does alkylation or reforming give a better gasoline blending stock? 5) How can you define isomerization? 6) How is an increase in octane rating achieved? 7) Can the isomerization reaction either consume or produce hydrogen?

4. Translate into English.

Качество газообразного сырья улучшают с помощью алкилирования и полимеризации. Сырьем для этих процессов являются легкие углеводороды. В процессе алкилирования происходит соединение изопарафина с олефинами. Конечный продукт приобретает желательную стабильность и высокое октановое число. В процессе алкилирования также получают стирол и синтетический каучук. Алкилационные установки более дорогие, чем установки для реформинга, но они дают лучший компонент смешения бензина.

5. Translate the following words with suffix **–ly** *(for reference see Appendix 1). What part of speech do they refer to?*

usually, continually, considerably, normally, probably, recently, particularly, naturally

6. Translate the following word combinations and make sentences with them. Let other students translate your sentences.

the principle of alkylation, motor fuel production, the combination of, the resulting product, desirable stability, high octane, production of petrochemicals, for example, to do one's bit, the amount of

UNIT 8

PRE-TEXT ACTIVITIES

1. Work with the dictionary and the vocabulary in this manual, find the meaning of the words and word combinations given below and memorize them. Pay particular attention to their pronunciation.

complex, consecutively, perform, slack wax, investigate, subsequent, finished oil compounding, deasphalting, power industry, transformer oil, select, supply (n) (v), output, required oil output, coalesce, oxidation, tray, tarry, nonsoluble, direct-contact condenser.

2. Find the proper Russian equivalents (B) for the following English terms and phrases (A).

A. 1) tray; 2) output; 3) slack wax; 4) tar; 5) direct-contact condenser; 6) nonsoluble; 7) oxidation; 8) investigation.

B. 1) смола; 2) тарелка; 3) смешивающий конденсатор; 4) парафиновый гач; 5) нерастворимый; 6) окисление; 7) исследование; 8) производительность.

3. Find pairs of antonyms. Translate the words.

A. 1) direct; 2) upward; 3) brief; 4) complex; 5) purification; 6) above; 7) maximum; 8) possible.

B. 1) long; 2) impossible; 3) contamination; 4) minimum; 5) indirect; 6) downward; 7) simple; 8) below.

4. Find synonymous pairs. Translate the words.

A. 1) subsequent; 2) perform; 3) production; 4) yield; 5) comprise; 6) tar; 7) subject; 8) consecutively.

B. 1) continuously; 2) expose; 3) combine; 4) following; 5) output; 6) manufacture; 7) gum; 8) do.

5. Word building: study exercise 1 once again, analyze what part of speech each word refers to, taking into account affixation. Make groups of nouns, adjectives, adverbs, verbs and provide your examples with the same prefixes and suffixes (for reference see Appendix 1). Translate them. Use them in phrases and sentences of your own.

Text 1

LUBE OIL MANUFACTURING

Production of high-quality lubricating oils is a very complex process with a number of consecutively performed operations with the initial charge stock, including:

Vacuum distillation of reduced crude in order to obtain distillate oils, deasphalting of residuum, solvent refining and solvent dewaxing of distillates and deasphalted oil, absorption purification, and in some cases rerunning the oil distillates. Slack wax and petroleum obtained in dewaxing processes can be applied for manufacturing of various wax products.

The processes mentioned above make it possible to produce high-quality lube oils for aviation, steam, diesel, automobile, and other engines practically from any crude type.

It can be recommended in order to ensure maximum utilization of the process unit equipment and low manufacturing cost of the products obtained, to investigate the properties of the crude oil expected to be handled, before the combination of the lube oil processing units is selected.

The entire lube manufacturing process comprises several separate processing units.

The first step in the lube oil production procedure is a two-stage (atmospheric and vacuum) crude distillation unit. Care should be taken when selecting the crude distillation unit capacity, to ensure the necessary charge stock supply not only for this unit, but also for the entire set of subsequent processing units to meet the required oil output.

The steps in the lube oil manufacturing process are: deasphalting, solvent refining and contact treating, dewaxing, vacuum distillation, absorption refining, and finished oil compounding units. Wax manufacturing processes are usually included into lube oil manufacturing plant.

Given below is a brief description of individual process units comprising altogether a complete oil manufacturing plant.

A two-stage crude distillation unit is used for separating the crude oil into fuel stock distillates, vacuum distillates in the vacuum section, and vacuum residuum as a bottom product. The vacuum distillates can be used either as feed stock for catalytic cracking units or for manufacturing of lube oils.

Distillates with various boiling ranges within 300 °C and 500 °C can be obtained in such units to meet market requirements.

Distillates boiling within 300 °C and 400 °C usually find their application as a base for producing oils necessary for the power industry, such as transformer oils, etc.

Other oil grades can, depending on the crude properties, be obtained either from a wide boiling range distillate (370 °C to 500 °C), or from separate cuts boiling within 350 °C and 420 °C and within 420 °C and 500 °C respectively.

The vacuum bottoms obtained in quantities such as 28 or 30 per cent of crude can, if the crude quality permits, be applied for direct production of residual oils or for obtaining various oil grades by compounding with distillate oils.

Vacuum tar produced in the two-stage distillation unit is transferred to a deasphalting unit through an intermediate tank.

Text 2

DEASPHALTING UNIT

Deasphalting of residual oils bases on dissolving the refined product in low-molecular paraffin hydrocarbons. In the unit of this type propane is used as such a low-molecular paraffin solvent.

In the propane deasphalting process the asphalteners and most of the gum coalesce and fall out from solution in the form of an easily removable plastic asphalt sediment. The latter can either be applied as fuel oil blending stock or sub-

jected to further processing in order to obtain petroleum asphalt (by oxidation), coke, or various distillates produced by coking.

The deasphalted product can be further treated so as to give high-viscosity residual oils of the cylinder and aviation type. It may also be used as compounding stock for manufacturing heavier diesel oil grades, in combination with distillate oils.

It can be seen from the simplified flow diagram of the propane deasphalting process, that the residual charge (vacuum residue) is pumped through a heat exchanger, in which it is preheated to the required temperature before it enters the deasphalting tower somewhat above its middle.

Liquid propane is drawn from the storage tank by a pump, and having passed a heat exchanger, enters the bottom of the tower.

The charge moves down the tower, in which it is intensively mixed on the trays with the moving upward liquid propane stream. The residual oil dissolves in the propane, while tarry matter, which is nonsoluble in propane, runs down to the tower bottoms to be continually removed.

Additional quantities of tarry matter and polycyclic hydrocarbons separate from the oil-in-propane solution flowing upward through the tower. This effect is achieved by virtue of the higher temperature conditions in this portion of the tower, caused by additional preheating of the solution with steam in a tubular exchanger.

The tower top and bottom temperatures are selected dependingly on the charge stock characteristics and can also be varied so as to ensure the desired product quality.

The oil-propane solution leaving the deasphalting tower top passes consecutively an evaporator heated by low-pressure steam and another evaporator heated by high-pressure steam. The oil leaving the second evaporator and containing the traces of propane is directed into a stripping column in which the propane is run off from the oil with the help of live steam.

The finished deasphalted oil is drawn off from the stripper bottom by a pump which delivers it through a cooler into the respective tank. The asphalt solution flowing from the bottom of the tower is passed through a single-stream fired heater where it is heated to the required temperature. Then it continues its flow into a third evaporator where most of the propane evaporates under pressure. The remaining is removed in a stripping column with the help of live steam. A pump draws off the asphalt from the stripper bottom and delivers it through a cooler into the respective tank.

High-pressure propane vapours leaving the evaporators are directed into condenser-and-cooler sets after which they complete their flow in the liquid propane tank.

Low-pressure propane vapours coming from the stripping columns lose their steam content in a direct-contact condenser, after which they are taken in

by a compressor, which delivers them through condensers and coolers into the liquid propane storage tank.

EXERCISES

1. Translate text 1 in written form.

2. Work in pairs. Student 1 asks Student 2 a question. Student 2 translates and answers it. Then Student 1 translates Student 2's answer. Take turns.

1) What operations are included in the production of high-quality lubricating oils? 2) Is it important to investigate the properties of the crude oil to ensure maximum utilization of the process unit equipment? 3) Wax manufacturing processes are usually included into lube oil manufacturing plant, aren't they? 4) Can the vacuum distillates be used as feed stock for catalytic cracking units or for manufacturing of lube oils? 5) Where do distillates boiling within 300 °C and 400 °C usually find their application? 6) Where can the vacuum bottoms obtained in quantities such as 28 or 30 per cent of crude be applied? 7) What can be seen from the simplified flow diagram of the propane deasphalting process? 8) Is tarry matter soluble or nonsoluble in propane?

3. Put all possible types of questions (general, special, alternative, tag) to text 2 (for reference see Appendix 3). Let other students translate and answer them.

4. Summarize the contents of text 2 in English in the form of an abstract (for reference see Appendix 6). Translate your abstract into Russian.

5. Translate into English.

Соотношение пропана и гудрона составляет от 5:1 до 13:1. Оно зависит от качества сырья. Обычно берется объемное соотношение 8:1. Выход деасфальтизата зависит от качества сырья и составляет 25-45 %. Некоторые уникальные сорта нефти дают более высокий выход деасфальтизированного масла. Научно-исследовательская работа позволит разработать гибкую технологическую схему производства смазочных масел.

6. Fill in the blanks with appropriate words taken from those listed below. What grammar problem of translation can you find in the sentences (for reference see Appendix 3)? Translate the sentences.

taken, calculations, be introduced, state, important

1) It is necessary that the new process should … at our refinery. 2) It is most … that the desired product quality be ensured. 3) Care should be …, when

selecting the crude distillation unit capacity, to ensure the charge stock for the subsequent processing units. 4) It is desirable that he should inform us on the … of his experiment with a new solvent. 5) The necessary … might have been done.

7. a) Write out the italicized polysemantic words and consult a dictionary for their meaning.

b) Translate the sentences into Russian, analyzing types of conditional sentences (for reference see Appendix 3).

1) If you raise the *process* temperature, the *yield* of end product will increase. 2) We should obtain the desired octane rating if the operating *conditions* were more severe. 3) If we removed sulphur from the feed *stock,* the lead susceptibility of gasoline would be higher. 4) Had the new process been used last year, the *demand* for the product would have been *met*. 5) If the temperature decreases, the reaction *stops*.

UNIT 9

PRE-TEXT ACTIVITIES

1. Work with the dictionary and the vocabulary in this manual, find the meaning of the words and word combinations given below and memorize them. Pay particular attention to their pronunciation.

oxidation resistance, slurry, carbon and slurry forming tendencies, phenol extraction unit, semi-finished residual oil, melting point, ensure safety, preserve health, pipe heating system, steam tracing, depress, chill (n) (v), subzero temperature, by gravity, petrolatum cake, screw conveyer, water settling tank, filter drum, vacuum receiver, surge tank, flash tower, traces of solvent, dispose to the drainage, specific gravity, ammonia chiller.

2. Find the proper Russian equivalents (B) for the following English terms and phrases (A).

A. 1) water settling tank; 2) vacuum receiver; 3) filter drum; 4) slurry; 5) petrolatum cake; 6) screw conveyer; 7) surge tank; 8) flash tower; 9) ammonia chiller; 10) pipe heating system.

B. 1) аммиачный кристаллизатор; 2) шлам; 3) система обогрева трубопроводов; 4) буферная ёмкость; 5) испарительная колонна; 6) шнековый лоток; 7) барабан фильтра; 8) водоотделитель; 9) вакуумный аккумулятор; 10) лепешка гача.

3. Find the proper English equivalents (B) for the following Russian terms and phrases (A).

A. 1) рафинат; 2) азеотропная смесь; 3) деасфальтизат; 4) экстракт; 5) толуол; 6) кристаллы парафина; 7) смесь сырья с растворителем; 8) питательный бак; 9) фильтрование; 10) фенольная очистка.

B. 1) wax crystals; 2) azeotropic mixture; 3) filtering; 4) oil and solvent mixture; 5) feed tank; 6) raffinate; 7) phenol refining; 8) extract; 9) toluene; 10) deasphalted oil.

4. Word building: study exercise 1 once again and find attributive clusters (groups of words with a key noun and a number of attributive components modifying it) with attributes expressed by a noun or an adjective. Analyze each cluster and state if the attribute denotes a place (a beach house), time (evening newspaper), characteristics (overtime ban), reason (sickness pay), object (fish export), source (membership fees), purpose (face cream) or subject (UNESCO call). Translate the attributive clusters.

5. Translate the following word combinations containing the noun point.

melting point, boiling point, freezing point, dew point, pour point.

6. ***Odd man out****. Find the word which is different from the others in each row. Say why it is different. Translate all the words.*

1) ensure, preserve, depress, dispose, slurry.
2) heating, semi-finished, forming, tracing, settling.
3) specific, gravity, resistance, chiller, safety.

Text 1

PHENOL EXTRACTION

The phenol refining process of lube oils is a liquid extraction applied for raising their viscosity index, stability and oxidation resistance, for improving the colour as well as for reducing their carbon and slurry forming tendencies.

Phenol is used as solvent for refining of lube distillates and deasphalted oil (after deasphaltization of vacuum residuum).

The phenol extraction unit gives semi-finished residual and distillated oils (phenol extraction raffinates) which are later individually sent to further processing, including dewaxing, vacuum rerun, absorption purification and, finally, compounding into finished market oil grades.

Extract is also produced in the phenol extraction process, in addition to raffinates. It usually finds an application as fuel oil blending stock.

The phenol extraction process has some particular features caused by the necessity of handling high melting point products and solvent and by poisoning properties of the latter. Special measures are therefore incorporated in the unit to ensure safety and preserve the health of the operating personnel. A pipe heating system by means of steam tracing is also provided.

Charge and products of the phenol extraction plant are:

Charge:

Straight-run oil distillate. Deasphalted oil from deasphalting unit.

Products:

Distillate raffinate.

Residual raffinate.

Extract.

Text 2

SOLVENT DEWAXING UNIT

The purpose of the dewaxing process is to depress the pour point of lubricating oils by removing the wax from raw lube oil stock.

Any distillate or residual oil, no matter what its viscosity or crude sources, can be applied as feed stock in this process.

Dewaxed oil is obtained in the following way: solvent is introduced into the oil stock to be dewaxed in a proportion in which the wax crystals formed and the liquid flow attain viscosities most suitable for filtering. Thus produced oil and solvent mixture is then chilled and filtered to separate the raffinate from the crystallized wax.

A widely known solvent consisting of benzol, methyl-ethyl-ketone and toluene is applied in the unit described herein. The mixture proportions recommended depend on particular operating conditions and vary within 25 to 50 per cent methyl-ethyl-ketone, 12 and to 25 per cent toluene, and 40 to 60 per cent benzol.

The simplified flow diagram of the dewaxing unit shows the following:

Feed stock (wax oil) is drawn by a pump from the storage and delivered together with the solvent stream into a steam heater in which it is brought up to 60 °C or 70 ˚C. Then it passes into a water cooler to be cooled down to 30 °C or 40 °C. After this the oil and solvent mixture continues its flow through a double pipe heat exchanger and an ammonia chiller, and a result reaches a feed tank.

From the latter the charged mixture chilled to the required (sub-zero) temperature flows by gravity into a continuously operating vacuum filter.

The wax of petrolatum cake cut from the filter passes into a screw conveyer, and, further, into a tank from which a pump delivers it through a heat exchanger and a steam heater into a water settling tank.

Solvent vapours and steam leaving the strippers are passed in the form of condensate into the same settling tank. The slack wax or petrolatum cake deposited on the filter drum is washed there with solvent chilled by ammonia in a cooler in order to extract the oil contained in it. The dewaxed oil filtrate and the water solvent leaving the filter enter a vacuum receiver. From the latter they are pumped into a dewaxed oil mixture surge tank.

The mixture flows then from the surge tank in a continual stream through a vapour heat exchanger into the low-pressure section of a flash tower for recovery of the solvent contained in it. About 50 per cent of the solvent evaporate in this section.

The evaporator effluent is pumped through a fired heater into the high-pressure section of the flash tower. The solvent vapours pass from the tower top through a vertical vapour heat exchanger and, having condensed, accumulate in a dehydrated solvent receiver, into which also the solvent recovered in the tower is distillated. From the receiver the solvent partly re-enters the pump suction to be mixed with the charge, the remainder being pumped through a cooler into the filter wash pipe to extract the oil from the filter cake.

Dewaxed oil containing traces of solvent, flows from the flash tower high-pressure section into a stripper.

Solvent vapours leaving the stripper at its top condense in a water-cooled condenser, after which they enter the water settling tank. The stripper bottom product (dewaxed oil) is pumped into the wax-free oil storage through a cooler.

The slack wax or petrolatum mixture separated from the water in the settling tank is pumped through a heat exchanger and a fired heater into a wax or petrolatum flash section. Solvent vapours drawn from the top of this section condense in a water cooled condenser and run down into the solvent receiver. The bottom effluent of the flash section flows by gravity into the lower section where the wax is finally stripped of the solvent. The solvent vapours leaving the stripping section top are directed into the solvent and steam condenser and, further, into the water settling tank.

The wax effluent of the stripper bottom is pumped to the wax storage through a heat exchanger. The water mixture (sediment) is pumped into a fractionating column, from the top of which an azeotropic mixture of solvent vapours and steam is obtained, which condenses in a water-cooled condenser and returns into the water settling tank.

Water leaving the fractionating column bottom in a continual stream is disposed to the drainage.

EXERCISES

1. Translate text 1 in written form.

2. Work in pairs. Student 1 asks Student 2 a question. Student 2 translates and answers it. Then Student 1 translates Student 2's answer. Take turns.

1) What is the phenol refining process of lube oils designed for? 2) The phenol extraction process has some particular features, doesn't it? 3) Can you enumerate charge and products of the phenol extraction plant? 4) Is the purpose of the dewaxing process to depress or to raise the pour point of lubricating oils? 5) How is dewaxed oil obtained? 6) Where is the evaporator effluent pumped?

3. Complete and translate the following sentences.

1) The purpose of the dewaxing process is … . 2) A solvent consists of … 3) The mixture production depends on … . 4) The feed stock is delivered into … 5) The temperature of the stream in a steam heater is … . 6) Solvent vapours and steam leaving the strippers are passed into … . 7) The slack wax or petrolatum cake deposited on the filter is washed with … .

4. Translate the following text into English.

В процессе очистки смазочных масел фенолом повышается их индекс вязкости, стабильность, сопротивляемость к окислению, улучшается цвет и понижается тенденция к коксо- и шламообразованию. Фенол используется для очистки смазочных дистиллятов и деасфальтизата.

На фенольной установке получают полуфабрикаты остаточного и дистиллятного масел, которые раздельно направляются на дальнейшую переработку.

В процессе депарафинизации снижается температура застывания смазочных масел путем удаления парафина из сырых масел. В этом процессе используют широко известный растворитель, состоящий из бензола, метилэтилкетона и толуола. Смесь сырья и растворителя охлаждается и подается на фильтр для отделения рафината от выкристаллизовавшегося парафина.

5. Use the English-English dictionary and provide definitions of the following words (for reference see the text "Solvent dewaxing unit"). If possible, give as many synonyms as you can. Translate the words.

purpose, attain, suitable, herein, condition, simplify, steam, deposit, enter, pump (v), contain, section, dispose.

6. Listen to / read the world news blocks devoted to problems of oil & gas industry (Appendix 10) and provide consecutive interpreting / sight translation.

UNIT 10

PRE-TEXT ACTIVITIES

1. Work with the dictionary and the vocabulary in this manual, find the meaning of the words and word combinations given below and memorize them. Pay particular attention to their pronunciation.

clay, viscosity, flash temperature, remnant, admixture, colour, contact treatment, polar-active material, automobile oil, brand, adsorption process, at the heater outlet, weight, completion, contribute.

2. Find the proper Russian equivalents (B) for the following English terms and phrases (A).

A. 1) oil containing remnants; 2) undesirable admixtures; 3) adsorbent surface; 4) average clay requirements; 5) improve the colour of oil; 6) components possessing polar activity; 7) at the heater outlet; 8) contribute to removal; 9) market oil brands; 10) contact treatment.

B. 1) поверхность адсорбента; 2) компоненты, обладающие полярной активностью; 3) улучшить цвет масла; 4) остатки, содержащие масло; 5) нежелательные примеси; 6) на выходе из печи; 7) средний расход глины; 8) контактная очистка; 9) сорта товарных масел; 10) способствовать удалению.

3. Find the proper English equivalents (B) for the following Russian terms and phrases (A).

A. 1) автомобильное смазочное масло; 2) глина; 3) вес; 4) вязкость; 5) поверхность; 6) марка, сорт.

B. 1) clay; 2) surface; 3) viscosity; 4) brand; 5) weight; 6) automobile oil.

4. Find synonymous pairs. Translate the words.

A. 1) light; 2) sort; 3) preceding; 4) gravity; 5) possess; 6) complete; 7) average; 8) remnant.

B. 1) remainder; 2) weight; 3) brand; 4) heavy; 5) finish; 6) have; 7) middle; 8) foregoing.

5. Vocabulary work: study exercise 1 once again and state what part of speech nearly all the words refer to (see Appendix 1). Explain their meanings in English, using the English-English dictionary or providing synonyms.

Text

FINISHED MARKET OIL PRODUCTION

The lubricating oil components obtained in the processes described above, i.e. deasphalted, phenol refined, and dewaxed residual oils, and phenol refined and dewaxed distillate oils, are rerun in a vacuum distillation unit and contact-treated with clay or other adsorbents.

If lube oils are to be produced from residual stock only, the latter is subjected to some concentration only in the vacuum rerun unit, in order to increase its flash temperature and viscosity. The light distillate obtained as a by-product in this operation can be used as compounding stock for manufacturing of some low-viscosity oil grades.

Oil purification by means of adsorbent is the final step in the lube oil manufacturing process. Oil containing remnants of desirable admixtures such as excessive gums, solvent traces, etc., are improved in some aspects (colour, carbon residuum, stability, etc.) by treating with adsorbents and lose any remnants of selective solvents used in preceding operations.

Contact treating processes are based on the adsorption of oil components possessing polar activity, by the adsorbent surface.

The admixtures mentioned above, either present in the oil in a natural manner or introduced into it in the course of various refining processes, are polar-active materials. For this reason the application of solid adsorbents contributes to effective removal of the said undesirable admixtures from the oil.

Contact treating of lube oils is effected in the following way: the oil is mixed with an adsorbent, say with clay, after which the mixture is heated during a period necessary for completion of the adsorption process. Then the mixture is filtered to separate the clay from the oil.

The average clay requirements for treatment of residual lube stock are about 4 per cent weight of the oil to be refined.

The contact treating of residual stock is carried out at an oil mixture temperature of about 70 °C at the heater outlet. The yield of refined oil varies about 96 or 87 per cent of the feed.

The process temperature for treating distillate oil stock is about the same as mentioned above for residual stock. The clay consumption is then, however, about 3 per cent weight of the feed, and the yield of treated oil is within 97 or 98 per cent of the feed stock treated.

Most of market oil brands, such as automobile oils, diesel oils, etc., are prepared by compounding residual oil stock with distillates. Such a method permits to produce a wide range of lubricating oil.

EXERCISES

1. Translate the text in written form.

2. Work in pairs. Student 1 asks Student 2 a question. Student 2 translates and answers it. Then Student 1 translates Student 2's answer. Take turns.

1) What processes are the lubricating oil components obtained in? 2) Lube oils are to be produced from residual stock, aren't they? 3) Is oil purification by means of adsorbent the final step in the lube oil manufacturing process? 4) Are the admixtures present in the oil in a natural manner or introduced into it in the course of various refining processes? 5) How is contact treating of lube oils effected? 6) What are the average clay requirements for treating residual lube stock? 7) Is the contact treating of residual stock carried out at an oil mixture temperature of about 70 or 80 °C? 8) The yield of refined oil doesn't vary, does it? 9) What method is used to prepare most market oil brands?

3. Translate the following text into English.

Масла, содержащие остатки нежелательных примесей − избыточные смолы, остатки избирательных растворителей и другие примеси, после обработки адсорбентами улучшают свои свойства.

Процессы обработки адсорбентами основываются на адсорбции поверхностью адсорбента полярно активных составных частей масла.

Масло смешивается с адсорбентом, смесь нагревается в течение времени, необходимого для завершения адсорбции. После этого смесь фильтруется для отделения глины от масла. Компаундирование остаточного масла с дистиллятными маслами дает широкий ассортимент масел.

4. a) Name the underlined grammar phenomena in the following sentences (for reference see Appendix 3).

b) Translate the sentences in written form.

1) Lube oils are to be produced from residual stock. 2) Admixtures are to be removed. 3) The mixture is to be filtered. 4) The stability of oil is to be improved. 5) The reaction was to be carried out at about 70 °C. 6) The reaction should be carried out with a catalyst. 7) They would do the work in spite of all the difficulties. 8) In treating oils the engineer has to study the physical properties of adsorbents. 9) The product must be washed with caustic solution.

5. Read the material in Appendix 7, choose one of the model advertisements for written translation. Analyze it from grammatical, lexical and stylistic points of view. Translate your advertisement, paying particular attention to the words made prominent in the passage.

VOCABULARY

A

acceptance – применение
acid sludge – кислый гудрон
additives – присадки, добавки
adhere – прилипать, сцепляться
adjust – регулировать
adsorption process – процесс адсорбции
agent – реактив, вещество
agitator – мешалка
aim product – целевой продукт
air accumulator – пневмоаккумулятор
air blowing – продувка воздухом
air lift – пневмоподъемник
aldehydes – альдегиды
alkylation – алкилирование
alkylation enjoys a robust growth – алкилирование находит все большее применение
aluminium–cobalt-molybdenum catalyst – алюмо-кобальт-молибденовый катализатор
ammonia chiller – аммиачный кристаллизатор
anti-knock value – антидетонационная характеристика
ash – зола
asphaltic residue – гудрон
atmospheric and vacuum crude distillation unit – атмосферно-вакуумная установка / трубчатка
automatic equipment – средства автоматики
automobile oil – автомобильное смазочное масло

B

baffle – перегородка
bank – ряд, группа (труб)
barometric condenser – барометрический конденсатор
barrel баррель = 42 амер. галлона = 35 англ. галлонов или 159 литров
battery – батарея
behaviour – поведение, работа (при испытаниях)
benzene – бензол
benzene ring – бензольное кольцо
bitumen – битум, асфальт
blending stock – компонент смешения
blotter press – фильтр пресс
boiler fuel oil – котельное топливо
bottom product – остаток
bring down – сокращать, снижать
bubble, v – барботировать
bubble cap – колпачок барботажной ректификационной колонны
bucket elevator – ковшовый элеватор
bundle of tubes – связка труб
butylene – бутилен
by-product – побочный продукт

C

capacity – производительность, емкость, пропускная способность
loss in capacity – снижение производительности
carbon and slurry forming tendencies – тенденция к коксо- и шламообразованию
carbon residue – коксовое число
carrier – держатель
catalytic – каталитический
caustic solution – раствор каустической соды
caustic treatment outfit – узел щелочной обработки
caustic washing – промывка едкой щелочью
charge stock – загрузка
chill – замораживать, охлаждать
chiller – холодильник, кристаллизатор
clay – глина
clearance – пространство, зазор
coalesce – соединяться, слипаться
demulsiphying agent, demulsiphier – деэмульгатор

coat – покрывать
coil – змеевик
coke burning – выжиг кокса
combination – соединение, смешение
combined operation – комбинированная операция
combustion gases – газообразные продукты сгорания
composition – состав
compounding – смешивание, составление смеси
compressor – компрессор
concrete – бетон
condensate – конденсат
congealing of oil – застывание нефти
consistent – совместимый, согласующийся
consumption – потребление, расход
contact treatment – контактная очистка
contaminants – примеси
contaminate – загрязнять
contamination – загрязнение
continual = continuous – непрерывный
contribute – способствовать
controlled-volume feed pump – дозировочный насос
convection coils – змеевики конвекционной секции
convert – превращать
cooler – холодильник
crude oil, crude – (сырая) нефть
cu. m – кубический метр
cut, *n* – фракция
cut down – снижать, сокращать

D

deasphalting – деасфальтизация
decompose – разлагать(ся)
deethanizer – деэтанизатор
dehydrate – обезвоживать
delayed cracking – углубленный (замедленный) крекинг
deliver – подавать
deposit, *n* – отложение
deposit, *v* – отлагать(ся)
depress – понижать
derivative – производное вещество
detergent – моющее средство
dew point – точка росы
diaphragm-operated control valve – регулирующий клапан с мембранным приводом
diluent – разбавитель
direct-contact condenser – смешивающий конденсатор
disposal – удаление отходов / ликвидация без переработки; с переработкой, с утилизацией / продажа
dispose to the drainage – сбрасывать в канализацию
dissolve – растворять
distribution heads – распределительные головки
draw off – выводить, отводить
dry gas – сухой газ

E

economic incentive – экономический стимул
effluent – вытекающий поток, сток, промышленные отходы
electric desalting unit – электрообессоливающая установка
eliminate – исключать
engineering and economic calculations – технико-экономические расчеты
expose – подвергать воздействию
evaporate – испарять(ся)
excessive heat – избыточное тепло
exhibit – проявлять, обнаруживать
expediency – целесообразность
extract, *n* – экстракт
extract, *v* – извлекать, экстрагировать

F

fall out – выпадать
feed – сырьё
feed hopper – загрузочная воронка
feed stock – сырье
filtrate – фильтрат
filter casing – корпус фильтра
filter drum – барабан фильтра
filtering – фильтрование, фильтрация
finished gasoline – товарный бензин
finished market oil production – получение товарных масел
finished oil compounding – компаундирование товарного масла
finished lubricating oil grades – товарные масла
finished product manufacturing cost – себестоимость продукции
fired tube heater – трубчатый подогреватель
flash temperature – температура вспышки
flash tower – испарительная колонна
float-type level indicator – поплавковый уровнемер
flow – течь
flow diagram, flow sheet – технологическая схема
fluidity – текучесть, подвижность
flow transmitter – расходометр, датчик
fractionating column – ректификационная колонна
fuel blending stock – компонент котельного топлива
furnish – поставлять

G

gas fractionating plant – газофрракционирующая установка
gas lift – газлифт
gas oil – газойль
gasoline – бензин
gasoline pool – компаундированный бензин
gas plant – газогенераторная установка
grade – сорт
gravity: by gravity – самотеком
gum – смола
gum forming compounds – смолообразующие вещества

H

handle – перерабатывать
heat-absorbing process – процесс поглощения тепла
heat exchanger – теплообменник
heat recovery – регенерация тепла
heat transfer – теплопередача
high content – высокое содержание
high efficiency electrically driven centrifugal pumps – высокопроизводительные центробежные насосы с приводом от электродвигателей
high-octane motor gasoline – высокооктановый автомобильный бензин
high-octane motor gasoline blending stock – высокооктановый компонент смешения автомобильного бензина
high-potential electrostatic field – электрическое поле высокого напряжения
hydrocarbon – углеводород
hydrochloric – хлористоводородный
hydrocracker – установка гидрокрекинга
hydrocracking – гидрокрекинг
hydrofining – гидроочистка
hydrogenation – гидрирование
hydrogenizate – гидрогенизат
hydrogen laser – водородный лазер
hydrogen sulfide – сероводород
hydrotreating – гидроочистка

I

immiscible – несмешиваемый
impurity – загрязняющая примесь
independent circuit – независимый контур

initial contamination – исходная загрязненность
inject – вводить
installation cost – стоимость монтажа
intake – впуск, всасывание
intermediate (circulating) reflux – промежуточное (циркуляционное) орошение
intermediate rundown tank – промежуточная емкость
intermediate tankage – промежуточный резервуар
investment cost – инвестиционные расходы
isobutane – изобутан
isomer – изомер
isomerization – изомеризация

K

kerosene, kerosine – керосин
kerosene distillate – керосиновый дистиллят
kettle – котел

L

lag – отставать
layout – расположение, компоновка
lead susceptibility – чувствительность (бензина) к тетраэтилсвинцу
liquefied gas – жидкий газ
liquid phase – жидкая фаза
loosen – освобождать, ослаблять
lower portion – нижняя часть
LPG = liquefied petroleum gas – сжиженный нефтяной газ

M

machinery – оборудование, механизм
maintain – поддерживать
make provision for – обеспечивать
manpower – рабочая сила, людские ресурсы, кадры
material – вещество
matter – материя, вещество
meet the market requirements – удовлетворять требованиям рынка
mm mercury – *мм* ртутного столба
monomethanol amine – монометаноламин
motor octane number – октановое число по моторному методу
mount – устанавливать
moving bead catalyst – подвижный гранулированный катализатор

N

naphtha – лигроин
narrow boiling range cut – узкокипящая / узкая фракция
noncondensable gases – неконденсирующиеся газы

O

octane level; ~ number, ~ rating – октановое число
off-gas – отходящий газ
olefin – олефин
olefinic – олефиновый
operate – работать
operating conditions – условия эксплуатации
operating cost – эксплуатационные расходы
at the heater outlet – на выходе из печи
output – выход, продукция
required oil output – заданный объем получения масел
overhead – верхний
overhead distillate – погон (дистиллят), отбираемый с верха колонны / головной дистиллят
overhead vapour of the secondary tower – пары сверху второй колонны
oxidation – окисление
oxidation resistance – стойкость к окислению
oxo alcohols – оксо-спирты

P

packed column – насадочная колонна
paddle – лопасть, лопатка (турбины)
petrochemicals – продукты нефтехимической промышленности, нефтепродукты
petroleum – нефть
  petroleum cake – лепешка гача
phenol extraction – селективная очистка фенолом, процесс экстракции фенолом
  phenol extraction unit – установка очистки (масел) фенолом
pipe heating system – система обогрева трубопроводов
piping length – протяженность трубопроводов
pneumatic pressure controllers – пневматические регуляторы давления
point – точка
  boiling point – точка кипения
  freezing point – точка замерзания
  pour point – температура застывания
  melting point – точка плавления
polar-active materials – полярно активные соединения
port – отверстие, проход
powder-type catalyst – пылевидный катализатор
power industry – энергетика
precaution – предосторожность
precipitation space – зона отстоя
preheater – подогреватель
preserve – охранять
primary variables – основные параметры
process – перерабатывать
process conditions – режим (обработки)
processing section – секция переработки / технологический узел
process sequence – последовательность операций
processing unit – технологическая установка
prolonged continuous operation – длительная, непрерывная работа
promote – способствовать
provision – мера предосторожности
psig (pound per square inch gauge) – фунтов на квадратный дюйм *(по манометру)*
pump-and-compressor house – насосно-компрессорное помещение
purification of crude – очистка сырой нефти
purify – очищать

R

raffinate – рафинат
rank second – на втором месте
rapture – пробой
rate of flow – скорость потока, скорость истечения, расход жидкости
reactor – реактор
reboiler – ребойлер, кипятильник
reciprocating pump – поршневой насос
recirculate – рециркулировать
recording and controlling receivers – самопишущие регулирующие вторичные приборы
reduced crude – мазут, отбензиненная (крекированная) нефть
refine – очищать, перерабатывать
refining – переработка
refinery – нефтеперерабатывающий завод
reflux – орошение
reformate – продукт реформинга
reforming – реформинг
regard, *n* – внимание
regard, *v* – считать, рассматривать
regenerate – регенерировать
Reid vapour pressure (RVP) – упругость паров по Рейду
release into the drainage system – сбрасывать в канализацию
relegate *зд.* – предназначать
remote indicating receiver – дистанционный вторичный прибор-индикатор

required oil output – заданный объем получения масла
rerun – повторная / вторичная перегонка
research method, clear – *(октановое число)* по исследовательскому методу без добавления тетраэтилсвинца
residual – остаточный
residuum – остаток
rest – опираться
rich gas – богатый газ
route – способ, путь
rubber – резина, каучук

S

saddle – седло, гнездо, подкладка
salable – пользующийся спросом, ходкий *(о товаре)*
slip, *v* – скользить
s.c.f. (standard cubic foot) – стандартный кубический фут
scraper – скребок
screw conveyer – шнековый лоток
scrubbing – промывка
sediment – осадок
sediments – механические примеси
semi-finished residual oil – полуфабрикат остаточного масла
send away – выводить, отводить
servicing – обслуживание
set of settling tanks – ряд отстойников
settler – отстойник
severe – жесткий
  severe conditions – жесткие условия
  severe treatment – интенсивная обработка
shell – оболочка, кожух, корпус
shell-and-tube cooler – кожухотрубный охладитель
side cut – боковой погон
simple reciprocating pump – поршневой одноцилиндровый насос
simplified flow diagram – упрощенная технологическая схема
sizable – порядочного размера
slack wax – парафиновый гач
sludge – осадок, шлам
slurry – шлам
  slurry tank – шламовый отстойник
solubility – растворимость
solvent – растворитель
  solvent dewaxing – депарафинизация растворителями
  solvent refining – экстракционная очистка
specific gravity – удельный вес
spherical – шаровидный, сферический, сфероидальный
spur – способствовать, стимул
standpipe – стояк, вертикальная труба (для подъема катализатора)
steam heater – паровой подогреватель
steam tracing – паровой спутник
still and heat exchanger tubes – трубы печей и теплообменников
stirring – перемешивание
stock – сырье, загрузка
storage tank – резервуар для хранения
  storage tank area – товарный парк
superheated steam – перегретый пар
straight-run – прямогонный
  straight-run oil distillate – масляный дистиллят прямой гонки
strainer – фильтр
stream day – сутки работы
stringent – строгий, обязательный
stripping – отпарка
  stripping tower – отпарная колонна
styrene – стирол
submerged coil-type condenser – конденсатор погружного типа
submerged coil-type condenser and cooler – конденсатор-холодильник погружного типа
submerged tubular condenser – трубный конденсатор погружного типа
subzero temperature – минусовая температура
suction side of a crude pump – прием сырьевого насоса

sulphur – сера
sulphurous – сернистый
suppress – подавлять
surge tank – буферная емкость, промежуточный резервуар
sweating – выпотевание парафина
sweetening – очистка от активной серы
synthetic rubber – синтетический каучук

T

tar – смола
tarry – смолистый
T.E.L. Т.Э.С. – тетраэтилсвинец
thorough preparation of crude – тщательная подготовка сырья
throttle – дросселировать
toluene – толуол
top (live) reflux – верхнее (острое) орошение
tower – колонна
primary tower – первая колонна
traces of solvent – остатки растворителя
transformer oil – трансформаторное масло
tray – тарелка
treat – обрабатывать
treatment – обработка
trouble-free operation – безаварийная / бесперебойная работа
turboblower – турбовоздуходувка / турбогазодувка
two-stage distillation unit – атмосферно-вакуумная установка
two-stage ejector – двухступенчатый эжектор

U

undergo – подвергаться
undue – чрезмерный, неподходящий
unit – установка
unit boundaries – границы установки
unload – разгружать, разрушать, выброс
upgrade – улучшать / повышать качество
utilization – использование

V

vacuum receiver – вакуумный аккумулятор
value – ценность, величина, значение
valve – клапан
varnish – лак
vessel – сосуд, аппарат
virgin – прямогонный
viscosity – вязкость
volatility – летучесть

W

warm conveyer – шнек, винтовой транспортер
washing – промывка
water settling tank – водоотделитель
waste – отходы, потери, отбросы
wasteful – расточительный, неэкономный
white spirit – уайт-спирит (растворитель), нефтяной скипидар
withdraw – выводить
wax – воск, парафин

X

xylene – ксилол

Y

yield – выход

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APPENDIX 1

WORDBUILDING

Part of speech	Prefixes	Suffixes
Noun (n)	**re** – rerun – повторная перегонка **co** – coexistence – сосуществование **dis** – discomfort – неудобство **in** – inconvenience – неудобство **mis** – misfortune – несчастье **im** – impoliteness – невежливость **un** – unreality – недействительность **il** – illegality – незаконность **inter** – interrelationship – взаимоотношение	**-er / or** – constructor – инженер, конструктор **-ist** – environmentalist – защитник окружающей среды **-ment** – fulfillment – исполнение **-ess** – air hostess – стюардесса **-ian** – politician – политик **-ance** – significance – значение **-(t)ion** – pollution – загрязнение **-ity / -ty** – activity – деятельность **-hood** – manhood – мужественность **-y** – energy – энергия **-ship** – distributorship – оптовое распределение **-age** – leakage – утечка **-ism** – impressionism – импрессионизм **-ant** – pollutant – загрязнитель **-ence** – conference – конференция **-ure** – agriculture – сельское хозяйство **-ing** – meeting – встреча **-dom** – freedom – свобода **-sion / ssion** – collision – столкновение **-ness** – sickness – болезнь **(-s)ure** – measure – мера
Verb (v)	**co** – coexist – сосуществовать **de** – decompose – разложиться **dis** – disable – выводить из строя **in** – input – вводить **im** – implant – внедрять **inter** – interrogate – расспрашивать **ir** – irrigate – орошать	**-en** – lengthen – удлинять(ся) **-fy** – signify – значить **-ize** – vaporize – испарять(ся) **-ate** – cultivate – возделывать

Part of speech	Prefixes	Suffixes
Verb (v)	**over** – overdo – перестараться **re** – re-design – перекон-струировать **mis** – misinterpret – неверно истолковывать	
Adjective (a)	**un** – unusual – необычный **in** – inefficient – неэффективный **dis** – disappointing – неутешительный **im** – impolite – невежливый **non** – nonsulfurous – бессернистый **ir** – irresponsible – безответственный **post** – post-industrial – постиндустриальный **inter** – interdepartmental – межведомственный **il** – illegitimate – незаконный	**-ful** – harmful – вредный **-less** – careless – неосторожный **-ant** – significant – важный **-ous** – poisonous – ядовитый **-ing** – interesting – интересный **-al** – celestial – небесный **-ent** – efficient – эффективный **-ish** – childish – детский **-ible** – terrible – ужасный **-able** – favourable – благоприятный **-ic** – cosmic – космический **-y** – stormy – штормовой **-ary** – necessary – необходимый **-ive** – communicative – коммуникативный **-ian** – Russian – русский
Adverb (adv)		**-ly** – immensely – очень

APPENDIX 2

LIST OF IRREGULAR VERBS

Infinitive	*Translation*	*Past Indefinite*	*Participle*
abide	ждать, терпеть	abode, abided	abided
arise	возникать	arose	arisen
awake	будить	awoke, awakened	awoken
be	быть	was, were	been
bear	носить	bore	born, borne
beat	бить	beat	beaten, beat
become	становиться	became	become
befall	происходить	befell	befallen
beget	вызывать	begot	begotten
begin	начинать(ся)	began	begun
behold	увидеть	beheld	beheld
bend	сгибать(ся)	bent	bent
bereave	отнимать	bereaved, bereft	bereaved, bereft
beseech	просить, умолять	besought, beseeched	besought, beseeched
beset	осаждать	beset	beset
bet	заключать пари	bet, betted	bet, betted
bid	предлагать (цену)	bade, bid	bidden, bid
bind	связывать	bound	bound
bite	кусать	bit	bitten
bleed	кровоточить	bled	bled
blend	смешивать	blended, blent	blended, blent
bless	благословлять	blessed, blest	blessed, blest
blow	дуть	blew	blown
break	ломать	broke	broken
breed	разводить	bred	bred
bring	приносить	brought	brought
broadcast	транслировать	broadcast	broadcast
build	строить	built	built
burn	гореть, жечь	burnt, burned	burnt, burned
burst	взрываться	burst	burst
buy	покупать	bought	bought
cast	бросать	cast	cast
catch	ловить, поймать	caught	caught
choose	выбирать	chose	chosen
cleave	раскалывать	cleaved, clove, cleft	cleaved, clove, cleft
cling	цепляться	clung	clung

Infinitive	*Translation*	*Past Indefinite*	*Participle*
come	приходить	came	come
cost	стоить	cost	cost
creep	ползать	crept	crept
cut	резать	cut	cut
deal	заниматься (чем-л.)	dealt	dealt
dig	копать	dug	dug
do	делать	did	done
draw	тащить, рисовать	drew	drawn
dream	мечтать, видеть сон	dreamed, dreamt	dreamed, dreamt
drink	пить	drank	drunk
drive	везти	drove	driven
dwell	жить, обитать	dwelt, dwelled	dwelt, dwelled
eat	есть, кушать	ate	eaten
fall	падать	fell	fallen
feed	кормить, подавать	fed	fed
feel	чувствовать (себя)	felt	felt
fight	бороться	fought	fought
find	находить	found	found
flee	убегать	fled	fled
fling	бросаться, кидаться	flung	flung
fly	летать	flew	flown
forbear	сдерживаться	forbore	forborne
forbid	запрещать	forbade, forbad	forbidden
forecast	прогнозировать	forecast	forecast
forego	предшествовать	forewent	foregone
foresee	предвидеть	foresaw	foreseen
foretell	предсказывать	foretold	foretold
forget	забывать	forgot	forgotten
forgive	прощать	forgave	forgiven
forsake	оставлять, покидать	forsook	forsaken
freeze	замерзать	froze	frozen
get	получать, становиться	got	got, gotten
give	давать	gave	given
go	идти, ехать	went	gone
grind	молоть	ground	ground
grow	расти, выращивать	grew	grown
hang	вешать	hung, hanged	hung, hanged
have	иметь	had	had
hear	слышать	heard	heard

Infinitive	*Translation*	*Past Indefinite*	*Participle*
heave	поднимать	heaved, hove	heaved, hove
hew	рубить	hewed	hewn, hewed
hide	прятать(ся)	hid	hidden, hid
hit	ударять	hit	hit
hold	держать	held	held
hurt	ранить, травмировать	hurt	hurt
keep	держать, хранить	kept	kept
kneel	становиться на колени	knelt, kneeled	knelt, kneeled
knit	вязать	knitted, knit	knitted, knit
know	знать	knew	known
lay	класть, положить	laid	laid
lead	вести	led	led
lean	наклонять(ся)	leant, leaned	leant, leaned
leap	прыгать	leapt, leaped	leapt, leaped
learn	учиться, узнавать	learnt, learned	learnt, learned
leave	покидать, оставлять	left	left
lend	давать взаймы	lent	lent
let	позволять	let	let
lie	лежать	lay	lain
light	зажигать	lit, lighted	lit, lighted
lose	терять	lost	lost
make	делать, создавать	made	made
mean	значить, иметь в виду	meant	meant
meet	встречать(ся)	met	met
mislay	положить не на место	mislaid	mislaid
mislead	ввести в заблуждение	misled	misled
mistake	ошибаться	mistook	mistaken
misunderstand	неправильно понять	misunderstood	misunderstood
mow	гримасничать	mowed	mown, mowed
outdo	превзойти	outdid	outdone
outgrow	перерастать	outgrew	outgrown
overbear	одолеть	overbore	overborne
overcast	закрывать, затемнять	overcast	overcast
overcome	побороть, победить	overcame	overcome
overdo	перестараться	overdid	overdone
overhear	подслушивать	overheard	overheard
overtake	догнать, наверстать	overtook	overtaken
overthrow	перебрасывать	overthrew	overthrown

Infinitive	*Translation*	*Past Indefinite*	*Participle*
partake	принимать участие	partook	partaken
pay	платить	paid	paid
put	класть, ставить	put	put
read	читать	read	read
rebuild	отстроить заново	rebuilt	rebuilt
recast	переделывать	recast	recast
relay	перекладывать	relaid	relaid
rend	отрывать	rent	rent
retell	пересказывать	retold	retold
rid	освобождать	rid, ridded	rid, ridded
ride	ехать	rode	ridden
ring	звонить, звенеть	rang	rung
rise	в(о)сходить, вставать	rose	risen
run	бежать	ran	run
saw	пилить	sawed	sawn, sawed
say	сказать, говорить	said	said
see	видеть	saw	seen
seek	искать	sought	sought
sell	продавать	sold	sold
send	посылать, отправлять	sent	sent
set	помещать, класть	set	set
sew	шить, пришивать	sewed	sewn, sewed
shake	трясти	shook	shaken
shear	стричь, обрезать	sheared	shorn, sheared
shed	проливать, лить	shed	shed
shine	светить, сиять	shone, shined	shone, shined
shoot	стрелять	shot	shot
show	показывать	showed	shown, showed
shrink	уменьшать	shrank, shrunk	shrunk
shut	закрывать	shut	shut
sing	петь	sang	sung
sink	опускаться	sank, sunk	sunk
sit	сидеть	sat	sat
slay	убивать, уничтожать	slew	slain
sleep	спать	slept	slept
slide	скользить	slid	slid
sling	бросать, швырять	slung	slung
slink	красться	slunk	slunk
slit	разрезать	slit	slit

Infinitive	*Translation*	*Past Indefinite*	*Participle*
smell	пахнуть, иметь запах	smelt, smelled	smelt, smelled
smite	ударять, бить	smote	smitten
sow	сеять, высевать	sowed	sown, sowed
speak	говорить	spoke	spoken
speed	спешить	sped, speeded	sped, speeded
spell	писать / произносить по буквам	spelt, spelled	spelt, spelled
spend	тратить, проводить	spent	spent
spill	проливать	spilt, spilled	spilt, spilled
spin	прясть, крутить	spun, span	spun
spit	пронзать, плевать	spat, spit	spat, spit
split	раскалывать	split	split
spoil	портить(ся), баловать	spoilt, spoiled	spoilt, spoiled
spread	расширять	spread	spread
spring	создавать, порождать	sprang, sprung	sprung
stand	стоять	stood	stood
stave	ударять	staved, stove	staved, stove
steal	красть	stole	stolen
stick	наклеивать	stuck	stuck
sting	жалить, жечь	stung	stung
stink	вонять	stank, stunk	stunk
strew	разбрасывать	strewed	strewn, strewed
stride	шагать	strode	stridden
strike	ударять(ся)	struck	struck
string	завязывать	strung	strung
strive	стараться, стремиться	strove, strived	striven, strived
swear	клясться, присягать	swore	sworn
sweep	мести, подметать	swept	swept
swell	набухать	swelled	swollen, swelled
swim	плавать	swam	swum
swing	качать, раскачивать	swung	swung
take	брать, взять	took	taken
teach	учить, обучать	taught	taught
tear	рвать, разрывать	tore	torn
tell	сказать, рассказывать	told	told
think	думать	thought	thought
thrive	преуспевать	thrived, throve	thrived
throw	бросать	threw	thrown
thrust	ударять, бросать	thrust	thrust

Infinitive	*Translation*	*Past Indefinite*	*Participle*
tread	идти, шагать	trod	trodden, trod
undergo	испытывать	underwent	undergone
understand	понимать	understood	understood
undertake	предпринимать	undertook	undertaken
undo	открывать	undid	undone
upset	опрокидывать	upset	upset
wake	просыпаться	woke, waked	woken, waked
wear	носить	wore	worn
weave	плести, объединять	wove	woven
wed	соединять	wedded, wed	wedded, wed
weep	плакать, рыдать	wept	wept
win	побеждать	won	won
wind	наматывать	wound	wound
withdraw	забирать, отводить	withdrew	withdrawn
withhold	воздерживаться	withheld	withheld
wring	скручивать	wrung	wrung
write	писать	wrote	written

APPENDIX 3

GRAMMAR TABLES

Table A3.1

THE DEFINITE ARTICLE		
а) перед нарицательными существительными		
1. Перед существительным, обозначающим конкретный предмет, о котором даются или выясняются дополнительные сведения	**The flat** is quite large and comfortable. Where is **the book**?	Квартира довольно большая и удобная. Где книга?
2. Перед существительным, являющимся единственным в своем роде или в данной обстановке	When we went out, **the moon** was shining. **The manager** told you to do it at once. Open **the door**, please.	Когда мы вышли, светила луна. Директор сказал вам сделать это тотчас же. Откройте дверь, пожалуйста.
3. Перед существительным в функции обстоятельства места, если не подчеркивается значение *один из*	They went into the restaurant and sat down at **the table** by **the window**.	Они вошли в ресторан и сели за стол у окна.
4. Перед существительным, обозначающим вещество в определенном количестве или в определенном месте в данной обстановке	Pass me **the salt**, please. **The snow** is dirty. Where is **the water**?	Передайте мне, пожалуйста, соль. Снег грязный. Где вода?
5. В приложении при подчеркивании известности лица, к которому оно относится	You must know that Dreiser, **the** famous American **writer**, wrote a lot of interesting books.	Вы должны знать, что известный американский писатель Драйзер написал много интересных книг.

Table A3.1 continued

6. После слов **one of, some of, many of, each of, most of;** обычно после слов **all, both**	Give me **one of the books**. **Some of the mistakes** are very bad. **Most of the stories** are very interesting. **Each of the boys** received a free ticket. I've looked through **all the magazines**.	Дайте мне одну из (этих) книг. Некоторые ошибки очень грубые. Большинство рассказов очень интересны. Каждый мальчик получил бесплатный билет. Я просмотрел все (эти) журналы.
7. Перед существительным, имеющим определение, выраженное прилагательным в превосходной степени, перед словами **same, following** и порядковыми числительными, а также словами **next** в значении *следующий по порядку* и **last** в значении *последний*	This is **the most responsible task** of all. He was worried by **the same problem**. Remember **the following rules**. He missed **the first lecture**. **The last week** of the month was full of events. She left school in 2000 and got to the University **the next year**.	Это наиболее ответственная задача. Его беспокоил тот же вопрос. Запомните следующие правила. Он пропустил первую лекцию. Последняя неделя месяца была полна событиями. Она окончила школу в 2000 г. и в следующем году поступила в университет.
8. Перед причастиями, субстантивированными прилагательными и перед словом **people** в значении *народ*	During the war she looked after **the wounded**. **The old** don't always understand **the young**. The Japanese **people** don't agree with it.	Во время войны она ухаживала за ранеными. Старые люди не всегда понимают молодежь. Японский народ не согласен с этим.
9. Перед существительными в единственном числе, которые обозначают целый класс предметов	**The dog** is a friend of man.	Собака – друг человека.

Table A3.1 continued

б) перед именами собственными		
1. Перед именем собственным, обозначающим целиком всю семью	I haven't met **the Browns** since they returned from London.	Я не встречался с Браунами с тех пор, как они вернулись из Лондона.
2. Перед именем собственным, имеющим ограничивающее определение	He was again **the Charles** she used to know years ago.	Он опять был тем Чарльзом, которого она знала много лет назад.
3. Перед названием некоторых стран и местностей	He traveled widely throughout **the United States**.	Он много путешествовал по США.
4. Перед названиями океанов, морей, рек и горных цепей	He traveled twice across **the Pacific**.	Он пересек Тихий океан дважды.
	Did you go to **the Black Sea** last year?	Вы ездили в прошлом году на Черное море?
	The Urals are not very high.	Уральские горы не очень высокие.
5. Перед названиями четырех сторон света	Have you ever been to **the South**?	Вы когда-либо были на Юге?
6. Перед названиями гостиниц, судов, английских газет	We'll go on board **the Pobeda**.	Мы поедем на пароходе «Победа».
	Would you like to put up at **the Plaza**?	Вам хотелось бы остановиться в гостинице «Плаза»?
	He often reads **the Morning Star**.	Он часто читает «Морнинг стар».

Table A3.1 continued

THE INDEFINITE ARTICLE		
1. Перед абстрактным существительным при наличии описательного определения	They lived **a quiet life**. He has **a deep knowledge** of the subject.	Они вели спокойную жизнь. У него глубокие знания в этой области.
2. Для обозначения принадлежности предмета к какому-либо классу предметов (с глаголами **to have, to see** и др., с оборотом **there is**, в именной части составного сказуемого) при наличии описательного определения и без него	**A man's** waiting for you. I have **a son** and **a daughter**. I want **a room** with **a bathroom**. Give me **a pen**, please.	Вас ждёт какой-то человек. У меня сын и дочь. Мне нужен номер с ванной. Дайте мне ручку, пожалуйста.
3. Перед существительным в приложении, если известность лица, к которому оно относится, не подчеркивается	Mr. Petrov, **an engineer** at our factory, spoke at the meeting yesterday.	Господин Петров, инженер нашего завода, выступал вчера на собрании.
4. В значении *один* перед исчисляемым существительным, обозначающим время	How many times **a month** do you go to the theatre? Will you be back in **an hour**?	Сколько раз в месяц вы ходите в театр? Ты вернешься через час?
5. В восклицательных предложениях после **what** перед исчисляемым существительным в единственном числе	What **a** lovely **day**!	Какой чудесный день!
6. Перед исчисляемым существительным в единственном числе, определяемым словами **such, quite, rather, most** (в значении *очень)*	This is such **a** difficult **sentence** that I can't translate it. He is quite **a** young **man**. This is rather **a** difficult **article**. It's **a** most interesting **book**.	Это такое трудное предложение, что я не могу его перевести. Он совсем ещё молодой человек. Это довольно трудная статья. Это очень интересная книга.

Table A3.1 continued

7. Перед существительным, определяемым порядковым числительным в значении *другой, ещё один*	Suddenly we heard a shot, then **a second,** and **a third**.	Вдруг мы услышали выстрел, затем второй (ещё один) и третий (ещё один).
8. В сочетаниях **a little** и **a few**	I'd like to say **a few words**.	Мне хотелось бы сказать несколько слов.
NO ARTICLE (Отсутствие артикля)		
1. Перед абстрактными существительными; перед названием вещества, если речь не идет о конкретном количестве; перед существительными во множественном числе в случаях, перечисленных в пунктах 2, 5, 6 (см. выше)	The work gives him **satisfaction**. **Snow** is white. I like to read English **books**. What lovely **flowers**! The three sisters are all **teachers**.	Работа его удовлетворяет. Снег белый. Я люблю читать английские книги. Какие чудесные цветы! Все три сестры – преподавательницы.
2. Перед именами собственными	**London** is the capital of England. I've been neither to **South Africa** nor to **North America**.	Лондон – столица Англии. Я не был ни в Южной Африке, ни в Северной Америке.
3. Перед существительным, определяемым словами **next** в значении *будущий* и **last** в значении *прошлый* (если существительное обозначает время) или количественным числительным, следующим за существительным	I went to Paris **last year**, and I am going there **next year** too. When **World War II** broke out, I was in Moscow.	В прошлом году я ездил в Париж и опять поеду туда в следующем году. Когда началась вторая мировая война, я был в Москве.
4. После глагола **to be** и некоторых других глаголов перед предикативом, обозначающим должность, занимаемую одновременно одним лицом	Who is **manager** of the office?	Кто руководитель этого учреждения?

Table A3.1 continued

5. Перед существительным, служащим обращением	How old are you, young **man**?	Сколько вам лет, молодой человек?
6. Перед названиями наук	I like **Literature** and **History**, but I don't like **Maths**.	Я люблю литературу и историю, но не люблю математику.
7. Перед существительным в заголовках, объявлениях и телеграммах	**Polish Delegation** Arrives in Moscow. **Great Blow** to Bus Users.	Прибытие польской делегации в Москву. Сильный удар по тем, кто пользуется автобусами.
8. Перед существительными **Mother, Father, Uncle, Auntie** и другие в речи членов одной и той же семьи	Has **Mother** come back yet? **Father** wants to speak to you.	Мама уже вернулась? С тобой хочет поговорить отец.
9. Перед существительным, стоящим при именах собственных и обозначающим звание (научное, воинское) или служащим формой обращения	**Academician N**. died several years ago. **Mr** Brown wishes to see **Dr** Smith.	Академик Н. умер несколько лет назад. М-р Браун хочет видеть д-ра Смита.
10. Перед существительными **advice, information, money, hair, fruit** и т.п. при отсутствии ограничивающего определения	This is important **information**. I need **advice** badly.	Это важная информация. Мне очень нужен совет.
11. В некоторых сочетаниях существительного с предлогом, когда все сочетание носит наречный характер: **in time, at home, at night, by bus, by heart, day by day, from year to year, from head to foot** и др.	You can get there **in time** if you go **by train**.	Вы можете добраться туда вовремя, если поедете поездом.

Table A3.2

PRONOUNS		
1. Личные	**I, you, he, she, it, we, you, they**	
2. Притяжательные: а) присоединяемые (к существительным) б) самостоятельные (без существительного)	**My, your, his, her, its, our, your, their** **Mine, yours, his, hers, its, ours, yours, theirs**	
3. Указательные	**This – these, that – those, it, same, such**	
4. Вопросительные: **who (whom), whose, which, what** (в вопросительных предложениях)	"**Who**'s this man?" "It's Zotov." "**What** is this man?" "He's a doctor." **Which** of you is a doctor? **What** time is it? **Whose** journals are these?	− Кто этот человек? − Это Зотов. − Кто этот человек? − Он врач. Кто из вас врач? Который час? Чьи это журналы?
5. Относительные: **who (whom), whose, which, that** (в определительных придаточных)	The actress **who** played the leading part was a great success. The writer **whose** book we are discussing now has traveled a lot about our country. Here's the letter **that (which)** I have just got.	Актриса, которая играла главную роль, имела большой успех. Писатель, чью книгу мы сейчас обсуждаем, много путешествовал по нашей стране. Вот письмо, которое я только что получил.
6. Союзные: **who (whom), whose, which, what** (в дополнительных и других именных придаточных)	Do you know **which** of them will go on the business trip? I wonder **what** they are speaking about. He was asked **whose** lecture they were going to hear.	Вы не знаете, кто из них поедет в эту командировку? Интересно, о чем они разговаривают. Его спросили, чью лекцию они собираются слушать.
7. Возвратные − **self-pronouns (myself,** etc.**)**: а) как часть глагола б) как часть предложения в) как средство усиления (сам)	He woke up to find **himself** in hospital. Is he angry with **himself**? Did you see it all **yourself**?	Проснувшись, он увидел, что находится в больнице. Он на себя (самого) рассердился? Ты сам всё это видел?

Table A3.2 continued

8. Взаимные: **each other, one another**	They were angry with **each other**. "What has happened?" people were asking **one another**.	Они были сердиты друг на друга. «Что случилось?» – спрашивали друг друга люди.
9. Отрицательные: **no, nobody, (no one), none, nothing** (в отрицательных предложениях)	There are **no** mistakes in this paper. **Nobody** has ever seen it. **None of them** have (has) ever been there.	В этой работе нет ошибок. Никто никогда этого не видел. Никто из них никогда не был там.
10. Неопределенные: **some, any** (и их производные)**, all, both, each, every** (и его производные)**, other, another, one**	If **anything** unexpected happens, I shall let you know. Would you like **some** tea? You are **both (all)** wrong. **Each** of them did his share (of the work). **Every** time I see this street I remember my childhood. He takes **every** opportunity of going to the theatre. What **other** stories do you know? Here is **another** story for you.	Если случится что-либо неожиданное, я дам тебе знать. Вы хотите чаю? Вы оба (все) неправы. Каждый из них сделал свою долю (работы). Каждый раз, когда я вижу эту улицу, я вспоминаю свое детство. Он использует всякую возможность пойти в театр. Какие ещё рассказы вы знаете? Вот вам ещё один рассказ.

Table A3.3

DEGREES OF COMPARISON (adjectives and adverbs)		
Положительная степень	Your book's as **interesting** as mine. His book's not so (as) **interesting** as hers. He speaks as **fast** as professor does. That product is twice as **expensive** as this one.	Ваша книга такая же интересная, как моя. Его книга не такая интересная, как её. Он говорит так же быстро, как профессор. Тот продукт в два раза дороже этого.

Table A3.3 continued

Сравнительная степень	This room's **smaller** than that one. This is **a more interesting** book. He speaks **faster** than you do. Could you speak **more clearly**?	Эта комната меньше той. Это более интересная книга. Он говорит быстрее вас. Не могли бы вы выражаться яснее?
Превосходная степень	The Lena is **the longest** river in Russia. This book's **the most interesting** I've ever read. He knows it **best** of all.	Лена – самая большая река России. Эта книга самая интересная из всех, которые я когда-либо читал. Он знает это лучше всех.
Образование степеней сравнения от другого корня	**good** **better** **best** **bad** **worse** **worst** **little** **less** **least** **much**, **many** **more** **most**	
Двойные степени сравнения	His **elder** brother's two years **older** than he (is). They went still **farther**, to the **farthest** end of the forest. We expect **further** information tomorrow.	Его старший брат на два года старше, чем он. Они пошли ещё дальше, в самый дальний конец леса. Мы ожидаем дальнейшую информацию завтра.
Much (= far), still как средство усиления сравнительной степени	Today I feel **much (far) better** than yesterday**.** The second book is **much (far) more interesting** than the first, and the third is **still more interesting**.	Сегодня я чувствую себя *гораздо* лучше, чем вчера. Вторая книга *гораздо* интереснее первой, а третья *ещё* интереснее.

Table A3.4

NUMERALS		
1. Количественные:	2,035,325 words (two million, thirty five thousand, three hundred and twenty-five words)	2.035.325 слов
	1,201 books (one thousand two hundred and one books)	1201 книга
номера комнат, домов, трамваев и т.д.	to take **the** 134 bus	ехать автобусом 134
	on page 305 (three hundred and five)	на странице 305
хронологические даты	in 2000 (in 'twenty 'hundred)	в 2000 году
	in 2005 (in 'twenty 'ou 'five)	в 2005 году
	in 2012 (in 'twenty 'twelve)	в 2012 году
2. Порядковые даты	the 35th (thirty-fifth) day	35-й день
	16th January, 1958 (**the** sixteenth **of** January, nineteen fifty-eight)	16 января 1958 года
	January 16 (16th), 1958 (January **the** sixteenth, nineteen fifty-eight)	
3. Дробные (простые и десятичные)	1/5 ton (one fifth **of** a ton)	1/5 тонны
	1/2 kilometer (half a kilometer)	1/2 километра
	1/4 kilometer (quarter **of** a kilometer)	1/4 километра
	2/5 ton (two fifths **of** a ton)	2/5 тонны
	0.5 (point five)	0.5
	3.215 (three point two one five)	3.215
	53.75 tons (fifty-three point seven five tons)	53,75

Table A3.5

ALL THE TENSE FORMS IN THE ACTIVE VOICE				
	Present	**Past**	**Future**	**Future in-the-Past**
Simple (Indefinite)	He **writes (doesn't write)** letters *every day*	He **wrote (didn't write)** a letter *yesterday*	He **will (won't) write** a letter *tomorrow*	(He said that) he **would (wouldn't) write** a letter *the next day*
Continuous (Progressive)	He **is (isn't) writing** a letter *now*	He **was (wasn't) writing** a letter *at 5 o'clock yesterday*	He **will (won't) be writing** a letter *at 5 o'clock tomorrow*	(He said that) he **would (wouldn't) be writing** a letter *at 5 o'clock the next day*
Perfect	He **has (hasn't)** *already* **written** a letter	He **had (hadn't) written** a letter *by 5 o'clock yesterday*	He **will (won't) have written** a letter *by 5 o'clock tomorrow*	(He said that) he **would (wouldn't) have written** a letter *by 5 o'clock the next day*
Perfect Continuous (Perfect Progressive)	He **has (hasn't) been writing** a letter *since morning*	He **had (hadn't) been writing** a letter *for two hours when I came*	He **will (won't) have been writing** a letter *for two hours when I come*	(He said that) he **would (wouldn't) have been writing** a letter *for two hours when I came*

Table A3.6

THE PASSIVE VOICE				
	Present	**Past**	**Future**	**Future in-the-Past**
Simple (Indefinite)	Letters **are (aren't) written** *every day*	The letter **was (wasn't) written** *yesterday*	The letter **will (won't) be written** *tomorrow*	(He said that) the letter **would (wouldn't) be written** *the next day*

Table A3.6 continued

	Present	Past	Future	Future in-the-Past
Continuous (Progressive)	The letter **is (isn't) being written** *now*	The letter **was (wasn't) being written** *at 5 o'clock yesterday*	—	—
Perfect	The letter **has (hasn't)** *already* **been written**	The letter **had (hadn't) been written** *by 5 o'clock yesterday*	The letter **will (won't) have been written** *by 5 o'clock tomorrow*	(He said that) the letter **would (wouldn't) have been written** *by 5 o'clock the next day*
Perfect Continuous (Perfect Progressive)	—	—	—	—

Table A3.7

QUESTIONS FORMATION					
Sentence Type			Subject	Predicate	Object or Adverbial Modifier
Affirmative sentence (Утвердительное предложение)			Alchemy The facts The book People Chemistry	**began to decline** **can be observed** **was published** **have long had** **studies**	in 1539. by us. in England. a lust for gold. compounds.
General questions (Общие вопросы)		**Did** **Can** **Was** **Have** **Does**	alchemy the facts the book people chemistry	**begin to decline** **be observed** **published** **long had** **study**	in 1539? by us? in England? a lust for gold? compounds?

Table A3.7 continued

Special questions	*When* *How* *Where*	**did** **can** **was**	alchemy the facts the book	**begin to decline?** **be observed?** **published?**	–
Questions to the subject	*What* *Who* *What*		science	**began to decline** **was published** **can observe** **studies**	in 1539? in England? the facts? compounds?
Tag / Disjunctive questions (Расчлененные / Разделительные вопросы)	Alchemy **began to decline** in 1539, **didn't** it? The facts **can be observed** by us, **can't** they? The book **was published** in England, **wasn't** it? People **have long had** a lust for gold, **haven't** they? Chemistry **studies** compounds, **doesn't** it? Physics **doesn't study** chemical changes, **does** it?				
Alternative questions (Вопросы выбора)	**Did** alchemy **begin to decline** in 1539 *or* **did** it **begin to decline** earlier? **Can** the facts **be observed** by us *or* by you? **Was** the book **published** in England *or* **was** it **published** in Germany? **Does** chemistry **study** chemical *or* physical changes?				

Table A3.8

PARTICIPLES I & II		
Причастие I простое – doing выражает одновременность		
Употребляется: 1) как обстоятельство: а) времени	(While) **traveling** about the country, he saw very many interesting things.	*Путешествуя* по стране, он видел много интересного.
б) причины	**Not knowing** what the matter was, we couldn't help her.	*Не зная,* что с ней, мы не могли ей помочь.
в) образа действия или сопутствующих обстоятельств	He stood **looking** thoughtfully out of the window.	Он стоял, задумчиво *глядя* в окно.
2) как определение	I like films **showing** the life of famous people.	Я люблю фильмы, *показывающие* жизнь знаменитых людей.

Table A3.8 continued

Причастие I перфектное – **having done** выражает предшествование		
Употребляется как обстоятельство: а) причины б) времени Не употребляется как определение	**Having lost** the key, they couldn't get in. **Having left** school, he went to work in a factory. Everybody knows the name of the man **who** made that discovery.	*Потеряв* ключ, они не могли войти в комнату. *Окончив* школу, он пошел работать на завод. Все знают имя человека, *сделавшего* это открытие.
Причастие II – **painted**, **done** имеет значение страдательного залога		
Употребляется: 1) как определение 2) как обстоятельство	We were impressed by the events **described** in this article. When **asked,** he answered.	События, *описанные* в статье, произвели на нас большое впечатление. Когда его спросили, он ответил.

Table A3.9

THE ABSOLUTE PARTICIPLE CONSTRUCTION	
All preparations being made, they started the experiment.	*Когда все приготовления были сделаны,* они начали эксперимент.
The day being warm, we opened the windows.	*Так как день был теплый*, мы открыли окна.
Weather permitting, we shall be able to get there on Monday.	*Если позволит погода*, мы сможем добраться туда в понедельник.
The article deals with microwaves, **particular attention being paid to radio location.**	Статья посвящена микроволнам, *причем особое внимание уделено радиолокации*.
With the experiments having been carried out, they started new investigations.	*После того как были проведены опыты,* они начали новые исследования.

Table A3.10

-ING FORMS	
В следующих предложениях READING причастие	
My brother **is** *reading* a book. In the library you can see many **people** *reading* books. *Reading* the newspaper, the old man fell asleep.	Мой брат читает книгу. В библиотеке вы можете увидеть много людей, читающих книги. Читая газету, старик заснул.
В следующих предложениях READING герундий	
Reading a good book gives me a lot of pleasure. It is **no use** *reading* these notes. Excuse **my** *interrupting* you. I **am thinking of** *reading* a new A. Christie book. I **remember** *reading* a very clever article on market economy. He wouldn't **mind** *doing* it.	Чтение хорошей книги доставляет мне большое удовольствие. Бесполезно читать эти записи. Извините, что я прерываю вас. Я собираюсь прочитать новую книгу А. Кристи. Я помню, как читал очень хорошую статью о рыночной экономике. Он не прочь сделать это.
Сравните эти два предложения	
My **brother** is *reading* the latest story by R. Bradbury. *причастие* My **dream** is *reading* the latest story by R. Bradbury. *герундий*	Мой брат читает последний рассказ Р. Брэдбери. Я мечтаю прочитать последний рассказ Р. Брэдбери.
Сравните герундий и отглагольное существительное	
Reading a good book gives me a lot of pleasure. *герундий* **The** *reading* **of** a good book gives me a lot of pleasure. *отглагольное существительное*	Чтение хорошей книги доставляет мне большое удовольствие.

Table A3.11

INFINITIVE			
Значение разных форм инфинитива: чему я рад?			
Active	***Indefinite (Simple)***	I am glad *to speak* with you	рад поговорить с вами (всегда радуюсь, когда говорю)
	Continuous	I am glad *to be speaking* with you	рад, что сейчас разговариваю
	Perfect	I am glad *to have spoken* with you	рад, что поговорил
	Perfect Continuous	I am glad *to have been speaking* with you	рад, что уже давно (все это время) разговариваю
Passive	***Indefinite (Simple)***	I am (always) glad *to be told* the news	всегда рад, когда мне рассказывают новости
	Perfect	I am glad *to have been told* the news	рад, что мне рассказали новости

Table A3.12

To design plans of a new building is the work of an architect.	*Составлять* проекты новых зданий – работа архитектора.
His duty was **to observe** the operation of this system.	Его работа заключалась *в наблюдении* за работой этой системы.
The professor asked the student **to define** the unit of resistance more accurately.	Профессор попросил студента более точно *определить* единицу сопротивления.
Pyrometers are used **to detect** the heat objects radiate.	Пирометры используются (служат) *для обнаружения* тепла, излучаемого объектами.
A thermometer is an instrument **to show** the temperature.	Термометр – это прибор, *который показывает* температуру.
I have nothing **to read.**	Мне нечего *читать*.
He was the first (last) **to come.**	Он *пришел* первым (последним).
The text **to be translated** is difficult.	Текст, *который необходимо перевести*, сложный.

Table A3.13

COMPLEX OBJECT		
1. После глаголов **want, expect, wish, would like**	They wanted *me to make* the experiment. We never expected *you to do* this for us.	Они хотели, чтобы я провел эксперимент. Мы никак не ожидали, что вы сделаете это для нас.
2. После глаголов **see, hear, watch, notice**	I saw *her playing* the piano. I've never heard *him sing*. I watched *her close* the door and l*eave* the house.	Я видел, как она играла на пианино. Я никогда не слышал, как он поет. Я наблюдал, как она закрыла дверь и вышла из дома.
3 После глаголов **find, consider, believe (считать)**	He considered *them (to be) clever*.	Он считал их умными.
4. После глаголов **order, tell, allow, ask**	He told *us to translate* the text.	Он сказал нам перевести текст.
5. После глаголов **let, make, have** (заставлять)	Have *him do* this job. I want to have *my hair cut*.	Заставьте его сделать эту работу. Я хочу подстричься.

Table A3.14

COMPLEX SUBJECT	
1. **He** *is said* **to know** six languages. **He** *was said* **to know** six languages. **He** *is said* **to have gone** to London. **He** *was said* **to have gone** to London.	Говорят, что он знает шесть языков. Говорили, что он знает шесть языков. Говорят, что он уехал в Лондон. Говорили, что он уехал в Лондон.
2. **He** *appeared* **to be** an ideal man. You can easily get in through the window if **the door** *happens* **to be locked**. **They** *seem* **to know** all about it. **The plan** *proved* **to be** a great success.	Он казался идеальным. Вы можете легко попасть внутрь через окно, если дверь случайно захлопнется. Кажется, они знают всё об этом. План оказался очень удачным.
3. **He** *is likely* **to win** the prize. **He** *is sure* **to come**.	Похоже, что он выиграет приз. Он обязательно придет.

Table A3.15

CONDITIONAL SENTENCES	
Три типа условных предложений	
1. If someone *weighs* 70 kilograms at the North Pole, he *will* doubtless *weigh* less at the equator. The sky over cities *will be* much bluer if the factory chimneys *should not pour* so much smoke into the air.	Если кто-нибудь **будет весить** 70 кг на Северном полюсе, то на экваторе он, без сомнения, **будет весить** меньше. Небо над городами **будет** намного голубее, если заводские трубы **не будут выпускать** так много дыма в воздух.
2. If they *gave* him a new information about this method he *would use* it in his report. If he *were* in town he *would help* us.	Если бы они **дали** ему новую информацию об этом методе, то он **использовал бы** ее в докладе. Если **бы** он **был** в городе, то он **помог бы** нам.
3. If you *had given* me a good dictionary, I *should have spent* less time on this article translation.	Если **бы** вы **дали** мне хороший словарь, я **потратил бы** меньше времени на перевод этой статьи.

Смешанные случаи употребления времен в условных предложениях		
Условие относится к настоящему времени (II тип), а следствие – к прошедшему (III тип).	If I *were* acquainted with this famous professor, I *should have rung* him up yesterday.	Если бы я был знаком с этим знаменитым профессором, я бы позвонил ему вчера.
Условие относится к прошедшему времени (III тип), а следствие – к настоящему (II тип).	If I *had written* the composition yesterday, I *should be free* now.	Если бы я написал сочинение вчера, то был бы свободен сегодня.

Table A3.16

THE SUBJUNCTIVE MOOD	
It is improbable that he should have completed the research.	*Маловероятно, чтобы* он уже *завершил* исследование.
It was ordered that the machine (should) be tested once more.	*Было приказано, чтобы* машину *испытали* ещё раз.
He demanded that the work **should be started** at once.	Он *потребовал, чтобы* работа *была начата* немедленно.
We suggested that the device **be tested** under somewhat different conditions.	Мы *предложили, чтобы* прибор *был проверен* в несколько других условиях.

Table A3.17

MODAL VERBS AND SIMILAR EXPRESSIONS		
Modal Verbs	Examples	Meaning
can	**Can I stay** in the laboratory?	Permission
	Я могу остаться в лаборатории?	(Разрешение)
	Can you **explain** to me the formula?	Request
	Ты *можешь объяснить* мне эту формулу?	(Просьба)
	Students **can attend** any lecture.	Possibility
	Студенты *могут посещать* любую лекцию.	(Возможность)
	I **can't find** the book I need.	
	Я не могу найти нужную книгу.	Inability
	I **can do** it in no time.	(Невозможность)
	Я могу сделать это моментально.	Potency
be able to	**I'm able to do** it in no time.	(Способность)
could	**Could** I **borrow** your notes?	Permission
	Можно взять твои записи?	
	Could you **give** an example?	Request
	Приведите пример, пожалуйста.	
	We **could ask** Dr. Black for help.	Suggestion
	Мы *могли бы обратиться* к д-ру Блэку за помощью.	(Предложение)
	We **could do** it in no time.	
	Мы *могли сделать* это моментально.	Potency
were able to	We **were able to do** it in no time.	

Table A3.17 continued

may	**May** I **borrow** your notes? *Могу* я (*Можно* мне) взять твои записи? (более официально, чем **could)** The acid rain **may spoil** the crop. Кислотный дождь *может испортить* урожай.	Permission Chance (Шанс / Возможность)
might	It **might be** possible to make the experiment. *Есть возможность* провести эксперимент. He **might be** wrong, but he was open to reason. Он *бывал неправ,* но его можно было убедить.	Future possibility (Возможность в будущем) Chance
will	How many people **will work** here? Сколько людей *будет* здесь *работать*? There **won't be** much space. *Будет* мало места. I**'ll give** you my notes. Я *дам* тебе свои записи. Under these conditions the process **will be** irreversible. При этих условиях процесс всегда *будет (бывает)* необратимым. The door **won't open**. Дверь *не открывается*.	Future fact (Факт в будущем) Prediction (Предсказание) Promise (Обещание) Property (Свойство или его отсутствие)
would	**Would** you **speak** louder, please? *Говорите,* пожалуйста, громче. What book **would** you **like** to have? Какую книгу вы *бы хотели*? **Would** you **like** to join us? *Не хотите* к нам присоединиться? What time **would suit** you? Какое время вам *подходит?* **Would** you **do** this if we help you? Вы *сделаете* это, если мы вам поможем? Man **would** ever **ask** questions. Человеку всегда *свойственно задавать* вопросы. Nature **would** never **be exhausted** to challenge man with more riddles. Природа *неистощима* в своей способности ставить перед человеком всё новые вопросы.	Request Offer (Предложение) Invitation (Приглашение) Suggestion Property

Table A3.17 continued

shall	**Shall** I **do** this for you? Мне *сделать* это для вас? **Shall** we **ask** for volunteers? Нам *позвать* добровольцев? You **shall do** it as I say. Ты *сделаешь* так, как я говорю. We **shall let** you **know** our decision. Мы *дадим* вам *знать* о нашем решении.	Offer Suggestion Insistence (Restricted use) (Настоятельность) Intention on the part of the speaker, only in the 1st person
should	I think we **should do** this in time. Я думаю, что мы *должны* это *сделать* вовремя. It's an English journal, so you **should use** a dictionary. Это английский журнал, так что вам *следует пользоваться* словарем.	Recommendation (Рекомендация) Saying what is right or correct (Констатация того, что правильно)
must	Students **must attend** seminars. Студенты *должны посещать* семинары. Students **mustn't work** in the lab without the instructor. Студенты *не должны работать* в лаборатории без инструктора.	Obligation (Обязательность) Prohibition (Запрет)
be to	This metal **is to be found** in nature in a free state. Этот металл *находят (можно найти)* в природе в свободном состоянии.	Arrangement (Запрограммированность)
have to	He **has to attend** lectures. Он *вынужден посещать* лекции.	Circumstances (Обстоятельства)
Ought to	You **ought to start** at once. Тебе *надо начать* немедленно. They **ought to be** here by now. Они уже *должны быть* здесь.	Obligation (Logical necessity or expectation) (Логическая необходимость или ожидание)
Note: **Ought** denoting obligation and logical necessity is less categorical than **must**		

APPENDIX 4

ABBREVIATIONS

A / C, a / c, acc. (*account current*) – текущий счет
a.c. (*alternating current*) – переменный ток
adds (*addressed*) – адресовано
adse (*addressee*) – адресат, получатель
ad (*advertisement*) – рекламное объявление (*множ. число* – **ads**)
a.f. (*audio frequency*) – звуковая частота
a.m. (*ante meridiem*) – до полудня
amp (*ampere*) – ампер
app. (*appendix*) – приложение
Attn. (*attention*) – вниманию (кого-либо)
at. wt. (*atomic weight*) – атомный вес
B / E, B.E., b.e. (*bill of exchange*) – переводной вексель, тратта
B / L, b / l, B.L., b.l. (*bill of lading*) – коносамент
C (*Celsius*) – по Цельсию
cal. (*calorie*) – калория
cc., cc (*copies*) – указание на адресатов копий письма
CEO (*chief executive officer*) – исполнительный директор
cf. (*confer*) – сравните
CFC(s) (*chlorofluorocarbon(s)*) – фреон(ы)
cm (*centimeter*) – сантиметр
Co. (*company*) – компания
contr. (*contract*) – контракт
Corp. (*corporation*) – корпорация
CPU (*central processing unit*) – центральный процессор
CRT (*cathode-ray tube*) – электронно-лучевая трубка
cu in (*cubic inch*) – кубический дюйм
cur. 1) (*currency*) – валюта; 2) (*current*) – текущий
CV (*curriculum vitae*) – краткая биография
DC (*direct current*) – постоянный ток
dd 1) (*dated*) – датированный; 2) (*delivered*) – доставленный
Dep., **Dept**. (*department*) – 1) отдел; 2) министерство
doc. (*document*) – документы (*множ. число* – **docs.**)
doz., dz. (*dozen*) – дюжина
eaon (*except as otherwise noted*) – если не указано иначе
e.g. (*exempli gratia*, *лат*.) – например
EMF (emf) (*electromotive force*) – электродвижущая сила
enc., encl. (*enclosed, enclosure*) – вложенный, прилагаемый, вложение, приложение (к письму и т. п.)
exc., excl. (*except, excluding, exception, exclusion*) – исключая, исключение
expn (*expiration*) – истечение (срока)
F (*Fahrenheit*) – по шкале Фаренгейта

F (*frequency*) – частота
fig. (*figure*) – 1) цифра; 2) рисунок, схема
f.p.m. (*feet per minute*) – футов в минуту
FY (*fiscal year*) – финансовый год
g (*gram*) – грамм
gpm (*gallons per minute*) – галлонов в минуту
h (*henry*) – генри
h.a. (*hoc anno, лат.*) – в текущем году
hf. (*half*) – половина
hp (*horsepower*) – лошадиная сила (ед. мощности)
H.Q., HQ, h.q. (*headquarters*) – главное управление (компании, организации)
hr (*hour*) – час
id. (*idem, лат.*) – тот же
i.e., ie (*id est, лат.*) – то есть
inc., incl. (*including*) – включая
Inc., inc. (*incorporated*) – зарегистрированный как юридическое лицо (корпорация)
info (*information*) – информация
inv. (*invoice*) – счет-фактура
IOU (*I owe you*) – долговая расписка
j (*joule*) – джоуль
kg (*kilogram*) – килограмм
km (*kilometer*) – километр
kv (*kilovolt*)– киловольт
kw (*kilowatt*) – киловатт
l (*liter*) – литр
L / C, l.c., l / c (*letter of credit*) – аккредитив
LLC (*limited liability company*) – компания с ограниченной ответственностью
Ltd., ltd. (*limited*) – с ограниченной ответственностью
LOC (*letter of commitment*) – гарантийное письмо
m (*metre*) – метр
mc (*millicycle*) – миллигерц
mdse (*merchandise*) – товары
memo (*memorandum*) – записка
M.O., m.o. 1) (*mail order*) – почтовый перевод; 2) (*money order*) – денежный перевод, платежное поручение
M.T. (*metric ton*) – метрическая тонна
MV (*merchant (motor) vessel*) – торговое (моторное) судно
N / A (*not applicable*) – не применимо (*напр.,* пункт в анкете)
N.B., NB (*nota bene, лат.*) – важное замечание
NC, N.C., n / c (*no charge*) – бесплатно
o / l (*our letter*) – (ссылаясь на) наше письмо
PA (*power of attorney*) – доверенность
p.a. (*per annum, лат.*) – в год
par. (*paragraph*) – абзац, параграф, пункт

Plc, PLC (*public limited company*) – открытая акционерная компания с ограниченной ответственностью
PO (*post office*) – почтовое отделение
pp. (*pages*) – страницы
pp, p.p. (*per pro, лат.*) – от имени и по поручению
qv (*quod vide, лат.*) – смотри (там-то)
R & D (*research and development*) – научно-исследовательские и опытно-конструкторские работы (НИОКР)
rct (*receipt*) – расписка, квитанция
rept. (*report*) – отчет
re (*regarding*) – относительно
ref. (*reference*) – ссылка
RMS (*root-mean-square*) – средне-квадратический
rpm (*revolutions per minute*) – (число) оборотов в минуту
shipt (*shipment*) – отгрузка, отправка
sig. (*signature*) – подпись
tn. (*ton*) – тонна
urgt (*urgent*) – срочный
v., vs. (*versus, лат.*) – против
VAT (*value-added tax*) – НДС
V.I.P. VIP (*very important person*) – особо важное лицо
v.s. (*vide supra, лат.*) – см. выше
v.v. (*vice versa, лат.*) – наоборот
w / o (*without*) – без
& (*and*) – и (союз)
@ – коммерческое *at*
# (*number*) – номер (амер.)

APPENDIX 5

UNOBVIOUS DIMENSIONS

Штук	шт.	pc; pcs	pc = piece; pcs = pieces
Штук (*в противоположность комплекту*)	шт.	off	
Штук, *например: Резервуары для хранения питьевой воды (2 шт.)*	шт.	EA, ea	Each, *e. g. Potable Water Storage Tanks (2 ea.)*
Каждому (*например: 70 долл. / (человеко-час) каждому*)		EA	each (*e.g. $70.00 / manhour each*)
Оборотов в минуту	об/мин	rpm	revolutions per minute
Погонный метр	п.м.	r.m.	running meter
Погонный фут	пог. фут	LF	linear foot
Квадратный фут	кв. фут	sq. ft, SF	square foot
На тонну	1 / т	1 / TE	
(e.g. $ / TE)	per tonne		
Фунт	фунт	lb, LBS	libra
Фунт (*как единица силы: обозначает также условное давление арматуры*)	Условное давление по ANSI равно 150 фунтов на кв. дюйм	#	ANSI 150 #
Фунт на квадратный фут		psf	pounds / sq. foot
Фунт на квадратный дюйм	Фунт / кв. дюйм	psi	pounds / sq. inch = lbs / sq. inch
Фунт на квадратный дюйм, манометрический (*абсолютное давление*)		psig	pounds/sq. inch, gage
Фунт на квадратный дюйм, абсолютный (*абсолютное давление*)		psia	Pounds / sq. inch, absolute
Фунт на квадратный дюйм, дифференциальный (*перепад давления*)		psid	pounds / sq. inch, differential
Тысяча фунтов на квадратный дюйм		ksi	1000 psi
Килофунт		kp =kips	1000 pounds
Фунт на линейный дюйм		pli kli	pounds / linear inch 1000 pli
Фунт на линейный фут		plf	pounds / linear foot
Фунт на кубический фут		pcf	pounds / cubic foot

Фунт силы		lb_r	libra of force
Фунт массы		lb_m	libra of mass
л / (человек-сутки)		l / c / d	litre per capita per day
Нефтяной баррель		Bbl, bbls	barrel(s)
Баррелей в сутки		B / D	barrels per day
Кварт на милю (*единица измерения расхода бензина*)		Qt / mi	quart per mile
Сухой нормальный кубический фут		DSCF	dry standard cubic foot
Нормальный кубический фут в минуту		SCFM	standard cubic foot per minute
Галлонов в минуту		gpm	gallons per minute
Дюймов водяного столба (*малые давления, вакуум*)		In WC	inches of water column
Лошадиная сила (*брит.*)		h.p.	horse power
Лошадиная сила (*нем. и рус.; нередко встречается в текстах на английском языке*)		PS	pferdestarke (PS = 0,986 h.p.)
Гранов на галлон (*единица концентрации*)		gpg	grains per gallon (ppm = 17.1 gpg)

APPENDIX 6

ABSTRACT, PRECIS AND REVIEW WRITING

1. АННОТАЦИЯ

Аннотация представляет собой предельно краткое из всех возможных изложение главного содержания первичного документа, полученное в результате компрессии текста оригинала и в нескольких строчках дающее представление о его тематике. Аннотация не может заменить первичного документа, и ее назначение состоит в том, чтобы дать возможность составить мнение о целесообразности более детального ознакомления с данным материалом.

2. ОБРАЗЦЫ АННОТАЦИЙ

2.1. Physiology in diseases of the heart and lungs

Altschuler M. D. Physiology in diseases of the heart and lungs. New York, 1967 (обложка).

This book is a complete, systematic, and critical review of available physiologic studies in man in diseases of the heart and lungs. Thus it provides a basis for consideration of the nature of the disorders involved, the processes whereby specific symptoms occur, and the mechanism through which therapy is effective.

Various concepts of the nature of the mechanism involved in the causation of symptoms are discussed in the light of experimental data; theoretical considerations are minimized. Heretofore, proponents of a particular theory in this field have referred only to a segment of the data available. This book, by giving a complete review, offers a better basis for evaluation and, at times, reconciliation of conflicting concepts.

A unique feature of the book is the bibliography, which contains references to all the available literature on the subject, and hence will be of the greatest value to the investigators, teachers and specialists in the field, as well as to medical students.

The contents of the book have served as the basis for lectures given by the author to undergraduate and postgraduate students of medicine at Harward Medical School over a period of several years.

The author is Assistant Professor of Medicine, Harward Medical School, Director of Internal Medicine and Research on clinical Physiology, etc.

2.2. The bird faunas of Africa and Its islands

Moreau R. E. The bird faunas of Africa and its islands. Academic Press, New York; London, 1966 (реклама).

This book has two aims. One is to discuss the ecology and the distribution of birds throughout the African Continent and the neighbouring islands in relation to the immense climatic changes of the last twenty thousand years – in fact to present a dynamic zoogeography in which birds are treated as the prime material, but data from other organisms receive mention. The other aim is to show how various features of the bird faunas illustrate ecological principles and to bring into prominence a variety of ecological problems, with appropriate intercontinental comparisons. The faunas dealt with are of two kinds, the one geographically delimited, the other characteristic of a defined vegetation type. Treatment of the whole subject has been assisted by the author's many years' acquaintance with parts of Africa.

The approach is thoroughly original one and on the zoo-geographical side has been made possible only by the very recent advances in paleoclimatology. An exposition of this nature should have an appeal, not merely to the ornithologist and the specialist of Africa, but also to the evolutionist and to the ecologist in the wide sense, while for zoological teaching it provides a wealth of examples in a tropical context that is not as yet well documented.

3. АЛГОРИТМ НАПИСАНИЯ РЕФЕРАТА НА СТАТЬЮ

Рефератом называется текст, построенный на основе смысловой компрессии первоисточника с целью передачи его главного содержания. Материал в реферате излагается с позиции автора исходного текста и не содержит никаких элементов интерпретации или оценки. Цель реферата – заменить первоисточник и дать читателю возможность сберечь время при знакомстве с объектом описания. Отсюда вытекает требование: составлять рефераты таким образом, чтобы при их использовании у потребителя не возникла необходимость обращаться к первичному документу.

Алгоритм составления реферата:

1) Анализ логической структуры исходного текста.

2) Выделение ключевых фрагментов, которые подчеркиваются или выписываются из текста оригинала.

3) Перегруппировка фрагментов и составление логического плана текста.

4) Составление и редактирование текста реферата.

При составлении реферата необходимо уметь:

1) оформлять заголовочную часть реферата, которая должна включать следующие сведения: название статьи (текста); имя автора; название и

выходные данные журнала (сборника); указание страниц в журнале (сборнике); указание на количество рисунков, чертежей или схем в тексте первоисточника;

2) логически разделять текст на коммуникативные блоки;

3) выделять главную информацию в смысловом куске в форме ключевых фрагментов;

4) вычленять основную информацию в целом тексте в форме ключевых предложений и ключевых фрагментов;

5) перегруппировывать ключевую информацию в тексте;

6) составлять вторичный текст (реферат) на основе ключевого материала;

7) редактировать текст реферата, вводить в него переходные элементы;

8) формулировать главное содержание исходного текста в 3-4 предложения (выход в аннотацию).

4. ОБРАЗЕЦ РЕФЕРАТА

THE IMPORTANCE AND FASCINATION OF ARCTIC EXPLORATION

Exploration in the Arctic Circle still offers countless opportunities for fresh discoveries, but it is an adventure which is not to be undertaken lightly. As an occupation it is more lonely and remote than anything else in the world and at any moment the traveller must be prepared to encounter hazard and difficulty which call for all his skill and enterprise. Nevertheless such exploration will be carried as long as there are investigated areas to attract the daring and as long as the quest for knowledge inspires mankind.

Investigations have shown that the Arctic zone is rich in mineral deposits, but even if these deposits were themselves of little value, the economic importance of the Arctic would not be appreciably lessened. For it is generally agreed that «weather is made in the North», and as the success or failure of the harvests all over the world is largely determined by the weather, it follows that agriculture and all those industrial and commercial activities dependent upon it must be considerably affected by the accuracy of the daily weather reports. Modern meteorologists regard the conditions prevailing in the Arctic as of first-rate importance in helping them to arrive at accurate results in their forecasts.

Yet quite apart from any economic or other practical considerations, there is a strange fascination about this vast unconquered region of stern northern beauty. Those who have once entered the vast polar regions like to speak of their inexpressible beauty, the charm of the yellow sun and dazzling ice packs, the everlasting snows and unmapped land where one never knows what lies ahead; it may be a gigantic glacier, which reflects a beam of sunlight over its frozen expanse or some wonderful fantastically shaped cliff which makes an unfading

impression on the memory. It may even be an iceberg stately and terrifying, moving on its relentless way, for the Arctic is the birthplace of the great icebergs which threaten navigation.

Précis of the passage

The quest for knowledge will urge brave men to continue the uncompleted work of Arctic exploration, despite its danger, difficulty and unequalled loneliness. The Arctic zone possesses mineral wealth but even without it, would be economically important. For «weather is made in the North». Knowledge of the Arctic climatic conditions means more accurate prognostication and its dependent activities everywhere. Material considerations apart, all travellers to this vast unconquered Arctic have been fascinated by the stern beauty of ice-packs, everlasting snows and huge glaciers under the yellow sun, of unmapped expanses, strange-shaped cliffs and stately terrifying icebergs moving relentlessly to threaten navigation from their Arctic birthplace.

5. РЕЦЕНЗИЯ

В *рецензии* содержится анализ печатного произведения с указанием его назначения, структуры, основных выводов. Она может также давать оценку достоинств и недостатков рецензируемой публикации с точки зрения содержания, организации материала, языка и манеры изложения.

6. ОБРАЗЕЦ РЕЦЕНЗИИ

ENVIRONMENTAL CHEMISTRY

By R. W. Raiswell and P. Brimblecomb

As an introduction for students studying environmental science, geology or chemistry, it is superb. It should be compulsory reading for anyone who is involved in reporting on the environmental debate for a general readership. Instant authority for those of us who never took environmental science courses at university!

APPENDIX 7

ADVERTISEMENT TRANSLATION

Рекламой называется информация о потребительских свойствах товара и различных видах услуг с целью их реализации, создания спроса на них. Реклама является неотъемлемой частью маркетинга. Цели промышленной рекламы состоят в следующем: 1) распространении информации; 2) привлечении заказов; 3) получении запросов; 4) создании положительного образа фирмы.

Своеобразие рекламных текстов (РТ) заключается в том, что в них точность формулировок, присущая другим разновидностям научно-технического стиля, сочетается с разнообразными средствами усиления выразительности. Так, в РТ встречается большое количество прилагательных и наречий, дающих высокую положительную оценку продукту. В промышленной рекламе можно встретить неологизмы – новые слова или слова с новыми значениями. В связи с необходимостью передать максимум информации на сравнительно небольшой площади рекламного издания в РТ часто используются разного рода сокращения (e.g. spec – specification). В области синтаксиса в РТ можно отметить использование инверсии (обратного порядка слов). В предложении может отсутствовать один из главных членов – подлежащее или часть сказуемого.

В языке рекламы во многих случаях новые слова представляют собой намеренно искаженное написание или произношение общеизвестных английских слов: *wheaties* (вместо *wheat*); *cornfeth* (вместо *confetti*).

Многие слова-названия, используемые в языке американской рекламы, представляют собой специально «изобретенные» слова, например: *spic and span* – средство для чистки. Многие фирменные и рекламные названия изделий были специально придуманы так, чтобы уже само название давало исчерпывающую характеристику особенностей рекламируемого товара, например, *Cools* – ментоловые сигареты (уже в названии передается идея прохлады).

В языке рекламы существует множество сокращенных слов-названий, например, вместо полного названия *Coca-cola* (напиток кока-кола) просто говорят *coke*; вместо *Lucky Strikes* (сигареты) – *luckies*.

Грамматические особенности языка рекламы крайне своеобразны. В языке рекламы грамматика как бы уходит на второй план, поскольку главное в рекламе – достижение смыслового и эмоционального эффекта. Очень часто в языке рекламы используется превосходная степень. Продукция в рекламных объявлениях неизменно рекламируется как «наилучшая» – *the best*.

Новшества можно найти не только в сфере употребления рекламных слов-названий, иногда преднамеренно ломается и сама структура предложения. Например:

Buy the now car! – Покупайте современный автомобиль!

You're got the now look! – Вы выглядите модно!

She's got the now hair do! – У нее самая модная прическа!

Здесь наречие *now* употребляется несколько необычно – вместо необходимого прилагательного *modern.*

Составители рекламных текстов, лозунгов, повторов стремятся к тому, чтобы фирменное название продукции служило своего рода условным рефлексом и автоматически вызывало в сознании читателя соответствующий образ. Однако, учитывая все вышеизложенное, перевод рекламы вызывает определенные трудности. Например:

"Step into the new Millenium on your carpet!" Alma.

Понятно, что дословный перевод невозможен, поэтому адекватный перевод будет таким:

«Новое тысячелетие с персидским ковром!» фирма Алма.

"Astron Building systems. Fast, efficient solution throughout in Eastern Europe". Contact Astron Construction International Division. Tel., Fax, E-mail.

«Системы строительства фирмы Астрон. Быстрые, квалифицированные решения по всей Восточной Европе».

Обращаться: Отделение международного строительства фирмы Астрон. Тел.: факс: почта.

В зависимости от содержания, задач и характера воздействия рекламные издания можно разделить на два основных типа: ознакомительные, несущие минимальную предварительную информацию об изделии, устройстве, и информационные, насыщенные техническими данными, содержащие точные характеристики и параметры.

Как правило, производители товаров и услуг помещают свою рекламу в периодических изданиях. Цель рекламных статей и сообщений − заинтересовать читателя как потенциального покупателя. Этим обусловлена присущая стилю рекламы эмоциональность. При переводе рекламных сообщений на русский язык принято передавать только информативную часть сообщения, т.е. выполнять стилевую нивелировку.

В качестве примера рассмотрим рекламное сообщение, заимствованное из журнала *Byte*:

Digital Ethernet Adapters

Built for a new breed of network traffic

Network traffic seems to get bigger, bulkier and harder to handle every day. Give yourself a break. Switch to EtherWORKS 3 Turbo adapters from Digital, the ones built to move giant files without strain. Only EtherWORKS 3 Turbo 16-bit adapters have a powerful 128 KB of on-board buffer RAM that is dynamically allocated for optimal receive / transmit performance – on advanced feature that is ideal for Netwear packet-burst mode and multitasking environments like Windows NT. So nodes can process more packets without dropping them – even under the most demanding loads. In today's busy, bursty, multitasking real-world networks EtherWORKS 3 Turbo will give you more thundering speed than the adapter you're used to. And with software configuration, installation is a snap. So plug one in. Then get out of the way.

И далее следует обязательный адрес компании, предлагающей рекламируемые адаптеры.

Как следует из примера, стиль рекламного сообщения максимально приближен к разговорному. Но задача переводчика передать только техническую часть информации, которая представляет характеристики рекламируемого адаптера. Сначала, следовательно, следует отобрать предложения, в которых содержится такая информация. В этом примере такие предложения выделены подчеркиванием. Перевод, очевидно, следует представить в виде обобщения выделенной информации:

Фирма Digital предлагает 16-битные адаптеры EtherWORKS 3 Turbo, которые предназначены для обработки файлов больших размеров и имеющих запоминающее устройство объемом 128 КБ, используемое в качестве буфера, с динамическим перераспределением для достижения оптимальных показателей приема и передачи данных. Это позволяет эффективно использовать адаптер в режиме передачи пакетов данных в среде Netwear и таких многозадачных средах, как Windows NT. И поэтому узлы смогут обрабатывать большее количество пакетов без потерь даже при больших нагрузках. После установки платы адаптера настройка заключается в соответствующей программной конфигурации.

Заголовок можно передать следующим образом: *«Новые цифровые адаптеры фирмы Digital для сетей Ethernet».*

Основная трудность в данном случае для переводчика заключается в том, что необходимо иметь определенные фоновые знания, чтобы, проанализировав вкрапленную техническую информацию, передать ее на языке перевода. В рассматриваемом примере следует знать, что такое сетевой адаптер и какими параметрами он характеризуется.

Необходимо также иметь представление о конфигурации программного обеспечения и инсталляции применительно к программному и аппаратному обеспечению. Иначе перевод, например, следующего ниже отрывка вызовет определенные трудности или его смысл может быть передан неверно:

And with software configuration, installation is a snap. So plug one in. Then get out of the way.

Если же переводчик не обладает необходимыми фоновыми знаниями, то в лучшем случае будет иметь место так называемый «словарный» перевод.

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Our technical service team will thoroughly review your process scheme, flow diagrams, and adsorption unit operation conditions. Then we work with you to develop an adsorption system using Selexsorb or a combination of adsorbents to meet your specific processing needs.

Selexsorb adsorbents are designed to remove contaminants that could not be separated previously because of technical or economic reasons. By efficiently removing impurities downstream from the feed, Selexsorb adsorbents extend catalyst life, improve productivity, and reduce system downtime. What's more, your products are often upgraded in purity and properties when you use **Alcoa Selexsorb.**

For more information, contact Alcoa's Applications and Technical Service Group.

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No two refineries are exactly alike. So why settle for an off-the-shelf fluid catalytic cracking (FCC) package when you can have a cost-effective, customized process? Since 1980, Stone & Webster's FCC process has been the choice of refiners throughout the world for both grassroots projects and revamps. And with good reason.

Our FCC process was designed ***for*** refiners ***by*** refiners. Which not only explains its ability to deliver higher yields of gasoline and distillate at lower operating and maintenance costs, but also helps account for its flexibility, reliability and user-friendliness.

We customize your FCC process with easy-to-operate, one- or two-stage regeneration systems that start-up easily and quickly, regardless of control technology. Minimal coke and dry gas production mean maximum liquid yields and refinery profits. The simple mechanical design, based on standard materials and cold-wall construction, minimizes maintenance problems and costs, and can provide run lengths of up to five years.

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STONE & WEBSTER

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ENVIRONMENTAL COMPLIANCE … WITH **INCREASED PROFIT**
Looking to increase **crude unit efficiency?**

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Building on this successful alliance, Nalco / Exxon introduces a new approach to refinery desalting programs – **RESOLV®**

RESOLV *brings you:*

- Patented polymer chemistry and injection equipment – reduces oil and benzene in desalter effluent while reducing primary demulsifier dosage.
- Desalter evaluation and optimization software – increases throughput without sacrificing performance.

- New primary demulsifier chemistry designed to break difficult emulsions and water wet solids – reduces fouling, energy consumption and overhead chloride.
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Why talk with **anyone else?**

Nalco / Exxon – raising the industry standard on refinery desalting.

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With branch offices on all continents and more than 3,500 employees, Krupp Uhde ranks amongst the world's leading engineering and plant construction companies.

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Wondering how to extract more profit from your plant?
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Hyprotech ASA is dedicated to providing rigorous model-based on-line solutions that help you maximize your plant's profitability through:

- ***Real-Time Optimization***
- ***Performance Monitoring***
- ***Advanced Process Control***
- ***Operations Training Systems***
- ***Dynamic Modeling***
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Together with our automation partners MDC Technology and CAE, we deliver advanced services and applications that improve operating performance and reduce operating costs.

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Others around the globe have profiled from the experience of working with Hyprotech. ***Isn't it time you did too?***

For more information on Hyprotech ASA, contact one of the offices listed below.

APPENDIX 8

SUPPLEMENTARY TEXTS

Text 1

CATALYTIC CRACKING

Cracking heavy petroleum fractions into lighter more valuable ones can be accomplished using only heat − at temperatures of approximately 800 ˚F and higher. However, most commercial cracking units today employ catalysts. The catalyst not only gives cracking at lower temperature but also produces gasoline of higher octane than does thermal cracking.

Recent advances in the formulation of new cracking catalysts are partly the cause of the greater gasoline producing potential. Zeolitic, or molecular sieve, catalysts are now available to give greater gasoline yields while reducing cracked gas and coke production.

Recycling also improves the yield structure of catalytic cracking. To do this, only part of the conversion is permitted to occur during the first contact with the catalyst.

The gasoline that is produced is removed from the reaction zone before it has an opportunity to undergo undesirable secondary reactions. The remainder of the mix drops into a denser reaction zone where additional cracking occurs. A portion of the heavier products then are recycled to the feed stream.

The extent to which reactor products are recycled is usually established by practical considerations such as the product capacity of the fractionation section or the capacity of the furnace. Recycling generally can be increased profitably until it causes fresh feed intake to be reduced. This usually occurs when the total feed to the unit is 20-35 % recycle material.

Text 2

CRUDE DISTILLATION. THREE STAGES

Application: Serves as the basic refining process for the separation of crude petroleum into intermediates of special quality.

Charge: Crude oil.

Products: A complete range of fractions including: LPG, straight-run gasoline, reformer naphtha, kerosene, diesel fuel, heating oils, base stocks for wax and lubricating oil, fuel oil, asphalt and cracking stock.

Description: Crude oil fractions are produced in the unit in three stages:

1) an atmospheric fractionating stage produces the lighter oils;

2) an initial vacuum stage produces three well fractionated lubricating oil base stocks and a long residue for subsequent propane deasphalting;

3) a second vacuum stage, designed for low vacuum, fractionates surplus atmospheric bottoms not required for lube production and surplus initial vacuum stage residuum not required for deasphalting. This third stage adds to unit flexibility to remove catalytic cracking stock from surplus bottoms. A light ends fractionating section is included to stabilize the light straight-run gasoline.

Crude oil enters the unit through a heat exchanger train where heat is recovered from product and reflux streams. A desalter is provided to reduce salt content of feed charge. The desalted crude is further heated by hot streams from the atmospheric and vacuum towers and flows through the direct-fired crude charge heater.

The combined vapour and liquid effluent from this heater flows to the tower where the vaporized distillate is fractionated into a gasoline overhead product and four liquid side-stream products.

Reflux is provided by pump-around and pump-back streams. The overhead gasoline is condensed and pumped to a stabilizer where the gasoline is debutanized to provide LPG and straight-run gasoline. Reboiler heat for the stabilizer can be furnished by a pump-around reflux stream from the atmospheric tower.

Part of the reduced crude from the bottom of the atmospheric tower is pumped through a direct-fired heater to the vacuum lube fractionator. The distillate is separated into three lube oil side-streams and a vacuum gas oil stream. Reflux for the tower is provided by two pump-around streams. Propane deasphalting feed stock is withdrawn from the bottom of the tower.

The remainder of the atmospheric tower bottoms plus all the vacuum lube fractionator bottoms not required as deasphalting feed stock are combined and charged to the third direct-fired heater. In the tower the distillate is condensed in two sections and withdrawn as two side streams. The two side streams are combined to form catalytic cracking feed stocks. An asphalt base stock is pumped from the bottom of the tower. Two circulating reflux streams serve as heat removal media for the tower.

Text 3

CHEMICAL DESALTING

Application: To remove inorganic salts from crude oil so that these salts will not be present to cause plugging of exchangers, coking of furnaces, and corrosion. The processes also provide removal of arsenic and other trace metals which act as poisons to catalytic cracking catalysts.

Charge: Crude oil.

Product: Crude containing five to ten pounds or less of salts per thousand barrels.

Description: The salts normally present in a crude oil can be retained in a refinery charge as crystalline suspensions and as entrained solutions with water. These salts break down during processing to form acids which increase corrosion. They also deposit in exchangers and tube stills to limit flow and cause hot spots. Some of the metallic constituents of the salts act as catalyst poisons.

The salts are held in the crude oil by an organic film. They can be separated from the oil by water washing in the presence of special chemicals tailored to suit the type of salts present and the nature of the crude oil. The accompanying flow diagram shows a typical chemical desalting process.

The chemicals are added to the process stream with a pump which is usually of the positive displacement type. They are added upstream from the charge pump so they will become thoroughly mixed with oil. Caustic or acid may be part of the chemical mixture or either may be added separately later to adjust the pH of the solution.

Process water is used to dissolve the salts not already in solution. To assure good contact between the water and the crude, they are passed through a mixing valve to form an emulsion. In some cases the water is added upstream from the charge pump so that the emulsion is formed by the pump impellers.

The process is carried out at elevated temperatures. The temperatures vary from 150 °F to 350 °F depending upon the type of crude being processed. The heat lowers the surface tension of the oil, allowing water particles to coagulate easier. The heat also reduces the viscosity of the oil, giving less resistance to separation of the salt laden water.

A settler provides a quieting zone following the heat exchanger. The settler is often designed to allow settling times from 20 to 60 minutes. It may be equipped with baffles to reduce flow turbulence and channeling. Crude oil leaves the top of the settler while salts are withdrawn as a solution with the drain water.

Text 4

SOLVENT DEWAXING

Application: For the removal of wax from lubricating oil stocks.

Charge: Either distillates or residual stocks of practically any viscosity in the raw or refined state from any crude source can be dewaxed.

Product: Dewaxed oils with pour points equal to or within a few degrees of the dewaxing temperature.

Description: The accompanying flow diagram shows the flow through the unit. In operation the diluted solvent is introduced into the wax-bearing oil

stream in such amounts at selected points in the chilling cycle as to ensure a wax crystal structure and liquid viscosity most suitable for filtration.

The chilled charge mixture flows from the double pipe chillers through a filter feed tank drum-type vacuum filters in which compartmentized, cloth covered drums rotate, half submerged in enclosed filter cases. A wax-free oil filtrate solution is drawn through the filter cloth to filtrate tanks in which the vacuum which induces filtration, is maintained. The wax cake deposited upon the drum during filtration is washed with cold solvent as it emerges from the liquid level in the filter. Just before each of the filter drum compartments reaches the wax deflector, flue gas at low pressure is admitted through a blowback connection to the underneath side of the filter cloth. The bond between wax and cloth is broken and the washed wax falls into the wax discharge compartment.

Controllers in the flue gas piping maintain an atmosphere pressure in the filter hood.

The filtrate from the filtrate receiver is pumped through the double pipe exchangers to evaporators for recovery of the solvent. Heat for evaporating the solvent from the dewaxed oil solution and the wax mix may be supplied by either stream or fired heaters.

The solvent employed generally consists of a mixture of methyl-ethyl-ketone and an aromatic solvent (benzol, toluol, or a mixture of the two). Because of its relatively low boiling point, the solvent can readily be recovered from the dewaxed oil and wax solutions in simple evaporating equipment for continuous reuse.

Operating conditions: Dilution solvent dosages vary from a solvent-to-oil ratio of 10: 1 depending on the nature and viscosity of the charge stock. The temperature for dewaxing is dependent upon the desired pour point of the dewaxed oil and is equal to or only a few degrees below the pour point. Low pressures exist throughout the process.

Yields: The yields of dewaxed oil are dependent upon the wax content of the charge stock. Practically complete separation of oil from wax is obtained by the use of the cold displacement wash applied on the filter.

Text 5

VISBREAKING

Application: To produce a minimum of gasoline and a maximum of furnace oil, in addition to a stable fuel oil of reasonable pour point from a waxy topped crude charge.

Description: The topped crude feed stock is heated and thermally cracked slightly in the visbreaker furnace. The effluent product, after quenching with light gas oil, is directed to the tower or evaporator section of the fractionator,

where it is flashed. The tar accumulates in the base of the tower, the vapour being fractionated into gasoline and gas, light gas oil and heavy distillate in the upper part.

Heavy gas oil is withdrawn from the tower and charged to the heavy gas oil cracking furnace. The effluent material, after quenching, enters the evaporator, being flashed in admixtures with the visbreaker furnace effluent.

The tower bottoms are vacuum flashed, the distillate material being returned to the fractionator where it aids in making up the recycle charge to the heavy gas oil cracking furnace.

The vacuum tar is blended with light gas oil to meet the desired specifications, leaving a net production of furnace oil.

In some parts of the world the demand of middle distillates outweighs that of gasoline. With careful design, the proportion of furnace oil to gasoline production may be quite favourable, even while meeting rigid stability specifications of the fuel oil.

Text 6

COKING

Application: To produce cracking conditions so that the yields of gas oil and gasoline are increased.

Charge: Reduced crudes, cracked tars, heavy catalytic cycle oils, and asphalts.

Products: Gas oil, gasoline, gas and coke.

Description: The feed is heated and charged to the lower portion of a fractionator. Here the charge meets the hot vapours from the coking drum and light components are flashed from the crude.

The heavy residue passes from the bottom of the fractionator to a furnace where it acquires the heat of cracking. Then the heated residue is introduced into an insulated drum where the residence time is sufficient for coke to form and settle from the mixture.

The vapours from the coking drum return to the fractionator. Here the gas, gasoline and gas oil are separated and leave the unit. The heavier materials appear in the bottoms and are recycled to the coking operation.

When coke builds up to a predetermined level in one of the coke drums, flow is diverted to another drum so that the furnace operation is continuous. Thus, drums are operated in pairs with one on-stream while the other is being dumped.

A full coke drum is removed from the process flow, steamed to strip light hydrocarbons from the coke, and cooled by water injection. More recent designs use high pressure (over 1,000 psig) water jets to cut the coke from the drum.

Operating conditions: The normal range of operating conditions for which coking units have been designed are as follows:

Furnace outlet temperature….....900 ° − 940 °F
Coke drum temperature .....780 ° − 840 °F
Coкe drum pressure.....10 − 70 psig.

Yields: There is a wide variation in the product distribution depending on whether gasoline is to be produced during the coking operation or during subsequent cracking of the coker gas oil. Gasoline yields may be from 5 to 25 volume per cent of the charge to the coking unit.

Text 7

FLUID CATALYTIC CRACKING ORTHOFLOW

Application: For the selective conversion of petroleum fractions boiling above the saleable distillate range, to valuable light olefins, gasoline and furnace oil.

Charge: Atmospheric and vacuum gas oils, visbreaker and coker oils, decarbonized oil and, in certain cases, whole reduced crude.

Product: High-octane gasoline (frequently split into light gasoline for premium and superpremium and heavy gasoline for regular blends), furnace or diesel oil blend stock, olefins and isobutane for alkylation, butane and dry gas.

Description: The Orthoflow design provides straight line flow of catalyst between the vessels, virtually eliminating erosion encountered in pipe bends. In addition to the earlier Model "A" and "B" designs, the principle is now available in a new commercially proven Model "C" design. The new design incorporates selective cracking of fresh feed and recycle to produce lower yields of gas and coke and higher yields of desirable liquid products, while retaining the operating and maintenance advantages proven in the earlier designs.

Fresh gas oil feed and recycle from the fractionator are introduced into separate regenerated catalyst risers through hollow stem catalyst plug valves, which control the flow of catalyst into the risers.

The recycle riser normally terminates at the bottom of the reactor catalyst bed. The segregation of the fresh feed and recycle streams and the control of the catalyst flow to the individual streams allow greater flexibility in the degree of cracking of each stream.

The spent catalyst stripper is centrally located below the reactor section. The catalyst is steam stripped and flows down the standpipe to the regenerator. Here the coke formed in the reaction is burnt off the catalyst.

Text 8

PLATFORMING

Application:

1) to upgrade low-octane naphthas to premium quality motor fuels;

2) to produce high yields of aromatic hydrocarbons from select naphtha cuts;

3) to produce high-quality aviation gasoline components;

4) to produce required quantities of LPG from naphthas.

Charge: For motor fuel operation; straight-run and / or cracked naphthas boiling in the range of 150 ° − 430 °F. For aromatics or avgas operation; selected straight-run naphtha fractions.

Products: Motor fuel operation: Typical product is stable, requires no rerunning and can be produced at any desired quality to fit marketing requirements.

Aromatics operation: Product contains benzene, toluene, xylenes, and other aromatics. The charge stock, boiling range and unit operating conditions are adjusted to maximize production of the desired individual aromatics. Separation of aromatics from the Platformate is accomplished by Udex solvent extraction, followed by the recovery of individual aromatics in extremely high purity by distillation.

Description: A typical platforming unit may be divided into three parts: the reactor-heater section in which the charge plus recycle gas is heated and passed over the catalyst; the separation and compression section in which the reactor effluent is separated into gas and liquid streams, the gas being compressed for recycling, and the stabilization section in which the separator liquid is stabilized to the desired vapour pressure.

Depending upon the character of feed stock, it may be desirable to add a recycle gas scrubbing system to remove H_2S from the gas. The Refining process has proved valuable as a means of producing satisfactory feed stocks from otherwise unsuitable materials.

The principal chemical reactions involved are dehydrogenation of naphthenes to aromatics, dehydrocyclization of paraffins, hydrocracking of high-molecular-weight paraffins to lower-molecular-weight paraffins, isomerization of paraffins and of naphthenes, and desulphurization of sulphur compounds, forming hydrogen sulphide.

Operating conditions: The four major process variables are temperature, space velocity, pressure, and hydrogen recycle rate. The reactor temperature is normally in the range of 850 ° − 980 °F when operating at pressures from 200 − 800 psig.

APPENDIX 9

TESTING TRANSLATING SKILLS

Test 1

VARIANT 1

1. Vacuum distillation is distillation in which the liquid distilled is enclosed at a low pressure in order to reduce its boiling point. 2. Refineries are not always situated near either crude oil supplies (fields, ports, pipelines) or centres of consumption, as refinery location was often a political decision. 3. Demand for heavy fuel oils will continue to decrease with the closure of heavy obsolete industries, industrial upgrading and general conservation of energy. 4. Local demand for high octane gasoline will grow, and export markets will require high octane, unleaded, low benzene grades. 5. This means that only part of the natural gas is routed to the tubular primary reformer and that the balance is mixed with the primary reformer effluent and further reformed in an oxygen blown autothermal reformer. 6. In the methanol distillation unit, an energy saving three column design is applied to separate the pure methanol product. 7. The processing of different feedstocks has implications on purification catalyst and absorbent selection.

VARIANT 2

1. The new coalescer has been designed specifically to separate solutions following caustic and amine treatment of hydrocarbons and separation of dispersions following water washing stages in refineries. 2. The new unit will be designed to process 45 100 bpd of untreated or hydrotreated atmospheric residue. 3. The plant compressor operates within a predefined pressure range. 4. It also requires an auxiliary evaporator which, via steam, delivers the necessary power for sweating and melting. 5. The evaporation energy is at a higher and thus more efficient level for the direct cooling or evaporation of the refrigerant. 6. In a commercial plant the number of pipes is simply increased to achieve the necessary capacity. 7. This liquid is pumped to the downstream fractionation section for propylene recovery and propane recycle. 8. The slowly moving bed of catalyst circulates in a loop through the reactors and the regenerator. 9. The reaction section operates in a totally continuous mode, and the reactors do not need to shut down or cycle for catalyst regeneration.

VARIANT 3

1. Thermal cracking reactions limit the maximum practical temperature, and pressure, therefore, becomes the dominant variable. 2. The amount of olefin in the reactor effluent is dependent on the reactor outlet conditions. 3. The overhead vapours are condensed and collected in the overhead accumulator. 4. The reactor temperature and the temperature distribution are the most important variables for the control of conversion and selectivity. 5. Energy conservation in oil-producing Middle East countries is rapidly increasing and, at the same time, the demand for water is rising with industrialization. 6. The feed flow into a drum is maintained until the drum is nearly full and it is then switched to the empty drum to continue the coking process. 7. The solubility of oxygen in a wide variety of substances is known. 8. In these conditions, aldehydes are completely converted to primary alcohols while more than 90 per cent of ketones are hydrogenated into secondary alcohols, thus remaining present at levels of a few hundred ppm in the stabilized product.

Test 2

VARIANT 1

1. Перерабатываемое сырьё содержит 2 % серы. 2. Часть продукта, направляемая в первую колонну, обычно используется в качестве орошения. 3. Мазут подвергается дальнейшей переработке для получения сырья, используемого в процессе каталитического крекинга. 4. Для снижения капитальных затрат используется сочетание нескольких процессов в одной установке. 5. Сырую нефть очищают от солей и воды во избежание коррозии. 6. Верхний дистиллят направляется в стабилизатор для получения товарного бензина. 7. Вы обязательно должны прочесть статью о производстве смазочных масел. 8. Смазочные масла необходимо очистить от примесей. 9. Пары необходимо сконденсировать.

VARIANT 2

1. Они хотели принять участие в научной конференции, но не смогли. 2. Мы заказали оборудование для вакуумной обработки. 3. Недавно была разработана новая установка для гидрокрекинга. 4. В процессе каталитического крекинга необходимо использовать этот катализатор. 5. В процессе гидроочистки происходит удаление азота, серы и других веществ, отравляющих катализатор. 6. Желательно учитывать значительный расход пара. 7. Платиновые катализаторы используются в процессах ката-

литического реформинга. 8. Твердые адсорбенты способствуют улучшению качества продукта. 9. Смесь следует обработать кислотой.

VARIANT 3

1. Для транспортировки катализатора используется горячий воздух, транспортирующий катализатор по пневмоподъемнику в газосепаратор и затем в регенератор или в реактор. 2. Газ, бензин и газойлевые фракции получают в результате разделения продуктов реакции. 3. Сырьё предварительно нагревается в печи перед поступлением в реактор. 4. Выжиг кокса с помощью воздуха необходим для регенерации катализатора. 5. Производство высококачественных смазок является сложным процессом. 6. Перед переработкой сырой нефти необходимо исследовать её свойства. 7. Требуется, чтобы это вещество было удалено из раствора. 8. В этой части колонны очень важно поддерживать более высокую температуру. 9. Примеси должны быть удалены.

NEWS BLOCKS

- MORE PETROCHEMICALS REFINING NEWS CONTRACTS INKED FOR EGYPTIAN PETROCHEMICAL COMPLEX

Apr 7, 2014 Carbon Holdings Ltd. (CHL) of Egypt has let contracts for engineering, procurement, construction, and commissioning (EPCC) activities related to the development of its Tahrir petrochemical complex planned at Ain Sokhna, Egypt.

- AFPM: PETROCHEMICAL INDUSTRY NEEDS SKILLED WORKERS

Apr 2, 2014 The current boom in shale resource development has sparked an urgent need in the petrochemical industry for technically skilled workers to build, operate, and maintain about $100 billion of announced chemical projects, according to Peter L. Cella, president and chief executive officer of Chevron Phillips Chemical Co. LP.

- ETHANE SUPPLY SECURED FOR PROPOSED W.VA. ETHYLENE CRACKER

Mar 28, 2014 Brazil-based Odebrecht SA subsidiary Odebrecht Oil & Gas SA has let a contract to Antero Resources Inc. to become the anchor ethane supplier for the joint-venture's proposed Appalachian Shale Cracker Enterprise (Ascent) petrochemical complex in Wood County, W.Va.

- INEOS LETS CONTRACT FOR GRANGEMOUTH ETHANE TERMINAL

Mar 28, 2014 Ineos Europe AG, Switzerland, said it has reached the latest milestones in its $500 million survival plan to import US shale gas to its 210,000-b/d Grangemouth, Scotland, refinery and petrochemical complex.

- PETRONAS PROGRESSES ON RAPID PROJECT

Mar 27, 2014 BMT Asia-Pacific Pte. Ltd. (BMT), a subsidiary of BMT Group Ltd., has completed a concept design for the material offloading facility (MOLF) at state-run Petronas' proposed refinery and petrochemical integrated development (RAPID) complex at Pengerang in southeast Johor, Malaysia.

- IDEMITSU KOSAN RESTARTS ETHYLENE UNIT, PERMANENTLY IDLES CRUDE UNIT

Mar 26, 2014 Idemitsu Kosan Co. Ltd. has restarted operations at its Tokuyama petrochemical complex in Japan after an earthquake off the island of Kyushu resulted in the shutdown of all units at the facility on Mar. 14.

- FLINT HILLS SETTLES PORT ARTHUR POLLUTION CASE

Mar 20, 2014 Flint Hills Resources (FHR) has reached a settlement with the US federal government to implement innovative technologies to control harmful air pollution from industrial flares and leaking equipment at the company's 635,000-tonne/year (tpy) chemical plant in Port Arthur, Tex.

- WOODMAC: GLOBAL ETHYLENE DEMAND, PRODUCTION ON THE RISE

Mar 20, 2014 Ethylene-producing assets that have access to low-cost natural gas feedstocks, such as the ones in North America, will lead the competition in global ethylene markets, Wood Mackenzie researchers said, adding that ethylene producers will have to utilize different strategies depending on their location in order to stay competitive.

- FIRE HITS ISRAELI PETROCHEMICAL PLANT

Mar 11, 2014 Gadiv Petrochemicals Industries Ltd., a wholly owned subsidiary of Oil Refineries Ltd. (Bazan), currently is evaluating impacts from a fire that broke out on Mar. 7 in one of the xylene furnaces at the plant, which lies in Bazan's 180,000-b/d refining complex in the Haifa Bay area of northern Israel along the eastern Mediterranean Sea.

- SASOL ADVANCES US ETHYLENE PROJECTS

Mar 10, 2014 Sasol Ltd. said it has commissioned the world's first commercial ethylene tetramerization unit at its Lake Charles, La., chemical complex.

- MAINTENANCE PLANNED FOR JAMNAGAR REFINERY

Mar 10, 2014 Reliance Industries Ltd. (RIL), Mumbai, plans to shut down one of four crude distillation units for maintenance at its 1.24 million-b/d Jamnagar refining and petrochemical complex in Gujarat, India.

- EPA SETTLEMENT COULD IMPACT REFINERIES, PETROCHEMICAL PLANTS

Feb 27, 2014 The US Environmental Protection Agency has reached an agreement to settle a lawsuit filed by community groups in Texas and Louisiana forcing it to review, and if necessary, revise formulas that refineries and chemical plants use to report toxic emission levels.

- FIRE HALTS PRODUCTION AT LUKOIL'S RUSSIAN PETROCHEMICAL COMPLEX

Feb 27, 2014 A fire that occurred on Feb. 26 at Lukoil's 350,000-tonne/year Stavrolen petrochemical complex in Budennovsk, Russia, has been contained, the company said.

- POTENTIAL CHEMICAL INVESTMENT DUE TO LOW GAS PRICES TOPS $100 BILLION

Feb 20, 2014 Potential US chemical industry investment linked to plentiful and affordable natural gas and natural gas liquids from domestic shale formations has topped $100 billion, the American Chemistry Council announced.

- RUSSIAN FIRM LETS CONTRACT FOR ETHYLENE CRACKER FURNACE

Feb 17, 2014 Open Joint Stock Co. (OJSC) Kazanorgsintez has let a services-related contract to Technip for a grassroots furnace to be located at its ethylene plant in Kazan, Tatarstan, Russia.

- AXIALL SELECTS PARTNER FOR US GULF COAST ETHYLENE PROJECT

Feb 11, 2014 Axiall Corp. and South Korean firm Lotte Chemical have entered a 50-50 joint venture for the design, construction, and operation of a proposed 1 million tonne/year ethane cracker to be built in Louisiana.

- INDIA'S MRPL UPDATES REFINERY EXPANSION PROJECT

Feb 10, 2014 Mangalore Refinery & Petrochemicals Ltd. (MRPL), a subsidiary of Oil & Natural Gas Corp. Ltd., is nearing completion of a long-delayed expansion project at its 194,000-b/d refinery in Mangalore, India.

- JAPANESE REFINERY ON SCHEDULE TO CLOSE BY END-MARCH

Feb 6, 2014 JX Nippon Oil & Energy Corp., a wholly owned refining and marketing company of JX Holdings Inc. and Japan's largest refiner, said it is on track to stop crude oil processing altogether at its 180,000-b/d Muroran refinery, on the northern island of Hokkaido.

- AXIALL UPDATES REPAIR WORK AT LOUISIANA PLANT

Feb 6, 2014 Axiall Corp. said repairs are nearing completion at its Lake Charles, La., chemical complex following a Dec. 20, 2013, fire that occurred in the vinyl chloride manufacturing area of the plant.

- EPA RULE REQUIRES NEW REPORTING FROM REFINERS, CHEMICAL PROCESSORS

Feb 4, 2014 The US Environmental Protection Agency has finalized a rule under existing federal statutory law that establishes new reporting requirements for petroleum and petrochemical processors that use or plan to use five chemical substances identified generically as "complex strontium aluminate, rare earth doped" (CSA-RED).

- GUIDE TO WORLD CRUDES: ANNIVERSARY, EXTENDED LIFE PROMPT OSEBERG BLEND ASSAY UPDATE

Feb 3, 2014 Oseberg is one of the four largest oil and gas fields on the Norwegian Shelf. Current crude oil output averages about 144,000 b/d from the Oseberg field center (OFC), which consists of the connecting Oseberg A, B, and D platforms.

- VUNG RO PETROLEUM LETS CONTRACT FOR REFINERY PROJECT

Jan 21, 2014 Vung Ro Petroleum Ltd. (VRP) has let a services-related contract to Ineos for a 900,000-tonne/year polypropylene project at its grassroots refinery complex in Hoa Tam Commune in the Dong Hoa district of Phu Yen Province, Vietnam.

- FEEDSTOCK MENU EXPANDS AT NOVA'S CORUNNA PLANT

Jan 16, 2014 Nova Chemicals Corp., Calgary, has started processing its first ethane supplies sourced from Marcellus shale at its Corunna, Ont., refinery and petrochemical complex.

- MORE PETROCHEMICALS REFINING NEWS SASOL COMMISSIONS SOUTH AFRICAN ETHYLENE SPLITTER

Jan 14, 2014 Sasol Ltd. has commissioned a 47,000-tonne/year ethylene purification unit at its polymers plant in Sasolburg, South Africa.

- EXXONMOBIL WRAPS SINGAPORE PLANT EXPANSION

Jan 8, 2014 ExxonMobil Corp. has completed and commissioned the multibillion dollar expansion of its chemical complex in Jurgong Island, Singapore.

- NEW ETHYLENE CRACKER PLANNED FOR LOUISIANA

Dec 20, 2013 Axiall Corp. said it has selected the state of Louisiana as the location for a possible ethylene cracker to be built alongside a related derivatives plant, company said in a Dec. 19 release.

- CHEVRON PHILLIPS TO INCREASE OLEFIN CAPACITY

Nov 5, 2013 Chevron Phillips Chemical Co. LP has completed its study to expand normal alpha olefin capacity at its Cedar Bayou plant in Baytown, Tex., and has received approval to proceed with detailed engineering, design, and procurement of long-lead equipment.

APPENDIX 11

ADEQUATE TRANSLATION GENERAL REQUIREMENTS

Одной из самых сложных и неоднозначных проблем современного переводоведения является оценка качества перевода, которая волнует лингвистов, компании, выполняющие переводы на заказ, крупные промышленные корпорации, международные организации и политические институты, ведущие университеты, а также самих практикующих переводчиков.

Так, перевод научного и технического текста можно считать адекватным, если он отвечает следующим требованиям:

а) точная передача текста оригинала;

б) ясность изложения мысли с максимальной сжатостью и в форме, присущей русской научно-технической литературе. При переводе не следует переносить специфические особенности английского языка. Это особенно важно, так как необходимо, чтобы сформулированная мысль на русском языке соответствовала бы современной практике перевода;

в) перевод должен полностью отвечать общепринятым нормам русского литературного языка. Следует помнить о синтаксических конструкциях, отсутствующих в русском языке, но характерных для английского языка. Кроме того, необходимо помнить, что смысловая насыщенность предложения в английском языке к концу предложения ослабляется, а в русском языке – наоборот. Такое отличие объясняется структурой английского предложения;

г) при научном и литературном редактировании необходимо соблюдать единую терминологию, стандартные обозначения и сокращения. Перевод должен быть четким и сопровождаться соответствующими иллюстрациями (если они имеются) к тексту. При выборе переводного эквивалента в словаре необходимо учитывать контекст, так как многие термины научно-технической литературы многозначны в разных сферах науки и техники и даже в пределах одной отрасли могут иметь разные значения:

guide – гид, проводник *(разг.)*;
разведчик *(воен.),*
направляющая деталь *(тех.);*
волновод *(радио);*
корабль-уравниватель *(мор.).*

cross – крест *(разг.);*
крестовина *(тех.);*
скрещивание *(биолог.)*

Поскольку научно-техническая терминология постоянно развивается, даже уже широко распространенные термины могут приобретать новые значения. Если в тексте оригинала встречается термин, которого нет в словарях данной отрасли, то необходимо подобрать (переводной) эквивалент, используя справочники или специальную литературу данной отрасли. Можно создать новый эквивалент с учетом моделей образования терминов или перевести этот термин описательным путем, сохранив его в скобках на языке оригинала.

Перевод должен состоять из определенных частей.

1) Титульный лист.

2) Содержание текста.

3) Иллюстративный материал, графики, таблицы и т.п.

Титульный лист должен содержать:

- название организации, которая выпустила перевод;
- номер перевода;
- фамилию автора (в транскрипции родного языка);
- название переведенного материала (на родном языке и на языке оригинала);
- фамилию автора (на языке оригинала);
- аннотацию;
- название источника (на языке оригинала);
- количество страниц и иллюстраций;
- фамилию и инициалы переводчика, редактора;
- дату (месяц, год);
- место выпуска и индекс организации, которая выпустила перевод.

На титульном листе после названия перевода приводится краткое содержание перевода (аннотация) с таким расчетом, чтобы его можно было использовать при составлении каталога (картотеки) переводов.

Перевод текста (**содержание**) должен отвечать вышеуказанным требованиям.

Иллюстративный материал:

а) рисунки (фотографии, чертежи, графики) должны быть четкими и размещены в соответствующих местах или в конце текста;

б) формулы должны быть написаны четко;

в) весь иллюстративный материал должен иметь единую нумерацию, которая соответствует нумерации в оригинале.

Образец титульного листа

П Е Р Е В О Д №

Роберт Спилман, В. Грейс

Экономический анализ использования
газоразделительных мембран

Robert Spillman, W. Grace and Co., Columbia, MD 21044

Economics of Gas Separation Membranes

Аннотация. Производство газоразделительных мембран относится к новым технологическим процессам. В статье рассматриваются основы производительности газоразделительных мембран и их влияние на стоимость процесса разделения газа.

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