ДОНСКОЙ ГОСУДАРСТВЕННЫЙ ТЕХНИЧЕСКИЙ УНИВЕРСИТЕТ

УПРАВЛЕНИЕ ДИСТАНЦИОННОГО ОБУЧЕНИЯ И ПОВЫШЕНИЯ КВАЛИФИКАЦИИ

Кафедра «Лингвистика и иностранные языки»

Учебно-методическое пособие

к чтению англоязычных текстов по направлению

«Холодильная, криогенная техника и системы жизнеобеспечения»

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Аннотация

Методические указания к чтению англоязычных текстов по направлению 141200 «Холодильная, криогенная техника и системы жизнеобеспечения». Методические указания содержат тексты на английском языке и упражнения, способствующие развитию навыков чтения, перевода и устной речи.

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Оглавление

UNIT 1. REFRIGERATION

Text 1. History of Refrigeration

Задание 1. Запомните следующие слова:

to create – создавать; **cooling** – охлаждение; **pollution** – загрязнение; **sewage** – сточные воды; **unit** – устройство; **to design** – проектировать, конструировать; **to refrigerate** – охлаждать, замораживать; **to preserve** – сохранять; **to store** – хранить; **discovery** – открытие; **truck/lorry** – грузовик; **vehicle** – транспортное средство.

Задание 2. Догадайтесь о значении следующих словосочетаний:

prehistoric times, regular practice, ancient cultures, to lower water temperature, ice-making machines, temperature-sensitive chemicals.

Задание 3. Переведите однокоренные слова:

1) to refrigerate – refrigerant – refrigeration – refrigerated - refrigerator; 2) to cool – cooling – coolant – cooler - cool; 3) to store – storage – storing – a store; 4) to use – used – useful – usage; 5) to preserve – preservation – preserved.

Задание 4. Прочитайте и переведите текст.

The use of ice to refrigerate and thus preserve food goes back to prehistoric times. Through the ages, the seasonal harvesting of snow and ice was a regular practice of most of the ancient cultures: Chinese, Greeks, Romans, Persians. Ice and snow were stored in caves lined with straw or other insulating materials. Storing of ice allowed the preservation of foods over the warm periods. This practice worked well through the centuries, with icehouses remaining in use into the 20th century.

In the 16th century, the discovery of chemical refrigeration was one of the first steps toward artificial means of refrigeration. Sodium nitrate or potassium nitrate, when added to water, lowered the water temperature and created a sort of refrigeration bath for cooling substances.

During 17th - 19th centuries many scientists and inventors made a great contribution into development of refrigeration methods. Among them were William Cullen, Jacob Perkins, John Gorrie, Carl von

Linde and others.

Though the ice-harvesting industry had grown immensely by the 20th century, pollution and sewage had begun to creep into natural ice, making it a problem to use ice as a coolant. This raised the demand for more modern refrigeration units and ice-making machines.

In the 20th century, refrigeration units were designed for installation on railroad cars, trucks or lorries. Refrigerated vehicles are used to transport frozen foods, fruit and vegetables, and temperature-sensitive chemicals. Most modern refrigerators keep the temperature between -40 and 20 °C.

Задание 5. Найдите в тексте и запомните английские эквиваленты следующих словосочетаний:

1) изолирующие материалы; 2) хранились в пещерах, проложенные соломой; 3) льдохранилища использовались;4) искусственные средства охлаждения; 5) нитрат соды или калия; 6) внесли большой вклад; 7) начали проникать в природный лед; 8) повысить спрос; 9) железнодорожные вагоны; 10) замороженные продукты.

Задание 6. Расскажите на английском языке, что вы узнали об истории техники охлаждения.

Text 2. Current Applications of Refrigeration

Задание 1. Запомните следующие слова:

application – применение; **to freeze** – замораживать; **warehouse** – склад; **safely** – безопасно; **purification** – очистка; **vapor** – пар; **to maintain** – поддерживать, сохранять; **harmful** – вредный; **compound** – соединение; **to curtail** – сокращать.

Задание 2. Прочитайте и переведите текст.

Refrigeration has many applications, including, but not limited to: household refrigerators, industrial freezers, cryogenics, and air conditioning. Probably the most widely used current applications of refrigeration are for air conditioning of private homes and public buildings, and refrigerating foodstuffs in homes, restaurants and large storage warehouses. The use of refrigerators has allowed to keep fresh fruits and vegetables all the year round, and storing fish, meat

and dairy products safely for long periods.

In commerce and manufacturing, there are many uses for refrigeration. Refrigeration is used to liquify gases - oxygen, nitrogen, propane and methane, for example. In compressed air purification it is used to condense water vapor from compressed air to reduce its moisture content. In oil refineries, chemical and petrochemical plants refrigeration is used to maintain certain processes at the required low temperatures. Metal workers use refrigeration to temper steel. In transporting temperature-sensitive foodstuffs and other materials by trucks, trains, airplanes and sea-going vessels, refrigeration is a necessity.

With the invention of synthetic refrigerants based mostly on a chlorofluorocarbon (CFC) chemical, safer refrigerators were possible for home and consumer use. Freon is a trademark of the Dupont Corporation and refers to these CFCs, and later hydrochlorofluorocarbon (HCFC) and hydrofluorocarbon (HFC), refrigerants developed in the late 1920s. These refrigerants were considered at the time to be less harmful than the commonly-used refrigerants including methyl formate, ammonia, methyl chloride, and sulfur dioxide. In the 1970s, however, the compounds were found in CFC to be reacting with atmospheric ozone, an important protection against solar ultraviolet radiation, and their worldwide use as a refrigerant was curtailed.

Задание 3. Найдите в тексте и запомните английские эквиваленты следующих словосочетаний:

1) очистка сжатого воздуха; 2) уменьшить содержание влаги;

3) нефтеочищающие, химические и нефтехимические заводы; 4) требуемые низкие температуры; 5) ультрафиолетовое излучение солнца; 6) закаливание стали; 7) торговая марка;

8) важная защита; 9) привести газ в сжиженное состояние.

Задание 4. Составьте как можно больше словосочетаний из следующих слов и переведите их на русский язык: purification, industrial, sensitive, home, compressed, use, temperature, conditioning, commercial, low, consumer, air.

Задание 5. Работа в парах: задайте друг другу вопросы к тексту и дайте ответы на них.

Text 3. Methods of Refrigeration

Задание 1. Запомните следующие слова:

compression – сжатие; **absorption** – поглощение; **to melt** – плавиться, таять; **to sublime (to sublimate)** – сублимировать; **dry** – сухой; **foodstuffs** – пищевые продукты; **carbon dioxide** – двуокись углерода; **solid** – твердый; **liquid** – жидкий; **to vent** – выпускать; **heat** – теплота; **pump** – насос; накачать, нагнетать; **insulation** – изоляция; **to reduce** – сокращать, уменьшать; **to achieve** – достигать; **alternate** – чередующийся; **to reject** – отдавать, отвергать.

Задание 2. Догадайтесь о значении следующих слов:

method, cycle, laboratory, portable, effectiveness, thermoelectric, magnetic, classify, absorb, temperature, phase, atmospheric, pressure, circulate.

Задание 3. Прочитайте и переведите текст.

Methods of refrigeration can be classified as *non-cyclic*, *cyclic*, *thermoelectric* and *magnetic*.

Non-cyclic refrigeration

In non-cyclic refrigeration cooling is accomplished by melting ice or by subliming dry ice (frozen carbon dioxide). These methods are used for small-scale refrigeration such as in laboratories and workshops, or in portable coolers.

Ice is an effective cooling agent due to its melting point of 0°C at sea level. To melt, ice must absorb 333.55 kJ/kg of heat. Foodstuffs maintained at this temperature have an increased storage life.

Solid carbon dioxide has no liquid phase at normal atmospheric pressure, and sublimes directly from the solid to vapor phase at a temperature of -78.5 °C, and is effective for maintaining products at low temperatures during sublimation. Systems such as this where the refrigerant evaporates and is vented to the atmosphere are known as "total loss refrigeration".

Cyclic refrigeration

Heat naturally flows from hot to cold. Work is applied to cool a living space or storage area by pumping heat from a lower temperature heat source into a higher temperature heat sink. Insulation is used to reduce the work and energy needed to achieve and maintain a lower temperature in the cooled space. The operating

principle of the refrigeration cycle was described mathematically by Sadi Carnot in 1824 as a heat engine.

A *refrigeration cycle* describes the changes that take place in the refrigerant as it alternately absorbs and rejects heat as it circulates through a refrigerator. The most common types of refrigeration systems use the reverse-Rankine vapor-compression refrigeration cycle, although absorption heat pumps are used in a minority of applications.

Cyclic refrigeration can be classified as: vapor cycle and gas cycle. Vapor cycle refrigeration can further be classified as vapor-compression refrigeration and vapor-absorption refrigeration.

Задание 4. Найдите в тексте и запомните английские эквиваленты следующих словосочетаний:

1) точка плавления (таяния); 2) охлаждение в незначительном масштабе; 3) жилое помещение; 4) общая потеря холода;

5) тепловой двигатель; 6) продолжительный срок хранения;

7) принцип работы; 8) охлаждение совершается при помощи...;

9) приёмник отводимого тепла; 10) изменения, которые происхо-дят; 11) источник тепла.

Задание 5. Дополните предложения из текста и переведите их.

1) Solid carbon dioxide has no … . 2) Foodstuffs maintained at this temperature have … . 3) Heat naturally flows … . 4) A refrigeration cycle describes the changes that … . 5) … can be classified as vapor cycle and gas cycle. 6) Insulation is used to reduce the work and energy needed … . 7) Systems where the refrigerant evaporates and is vented to the atmosphere … .

Text 4. Vapor-compression and Vapor-absorption Cycles

Задание 1. Прочитайте и переведите текст, используя, если необходимо, словарь.

Vapor-compression cycle

The vapor-compression cycle is used in most household

refrigerators as well as in many large commercial and industrial refrigeration systems.

In this cycle, a circulating refrigerant such as Freon enters the compressor as a vapor. Then the vapor is compressed at constant entropy and exits the compressor as a vapor at a higher temperature, but still below the vapor pressure at that temperature. The vapor travels through the condenser which cools the vapor until it starts condensing, and then condenses the vapor into a liquid by removing additional heat at constant pressure and temperature. The liquid refrigerant goes through the expansion valve where its pressure abruptly decreases, causing flash evaporation and auto-refrigeration of, less than half of the liquid.

That results in a mixture of liquid and vapor at a lower temperature and pressure. The cold liquid-vapor mixture then travels through the evaporator coil or tubes and is completely vaporized by cooling the warm air (from the space being refrigerated) being blown by a fan across the evaporator coil or tubes. The resulting refrigerant vapor returns to the compressor inlet to complete the thermodynamic cycle.

Vapor-absorption cycle

After the development of the vapor compression cycle, the vapor absorption cycle lost much of its importance because of its low coefficient of performance (about one fifth of that of the vapor compression cycle). Today, the vapor absorption cycle is used mainly where fuel for heating is available but electricity is not, such as in recreational vehicles that carry liquid gas. It is also used in industrial environments where plentiful waste of heat overcomes its inefficiency.

The absorption cycle is similar to the compression cycle, except for the method of raising the pressure of the refrigerant vapor.

Задание 2. Найдите соответствующий перевод к подчеркнутым в тексте словосочетаниям.

1) коэффициент полезного действия (КПД); 2) мгновенное испарение; 3) расширительный клапан; 4) автофургон со всеми удобствами; 5) большие потери тепла; 6) давление пара; 7) задуваемый вентилятором; 8) испарительный змеевик; 9) удаляя сопутствующее тепло; 10) давление резко понижается; 11) впускное отверстие компрессора.

Задание 3. Ответьте на вопросы к тексту.

1) Where is vapor-compression cycle used? 2) Where is vapor cooled and condensed? 3) What is the function of condenser? 4)

What causes flash evaporation? 5) Why is vapor-absorption cycle not so widely used as vapor-compression cycle? 6) Where is vapor-absorption cycle used?

UNIT 2. AIR CONDITIONING

Text 1. Air Conditioning

Задание 1. Запомните следующие слова:

primarily – главным образом; **to cool** – охлаждать; **to heat** – нагревать; **residential** – жилой; **refrigeration cycle** – холодильный цикл; **aqueduct** – водопровод; **motor vehicle** – транспортное средство; **to trickle** – капать, течь тонкой струйкой; **appliance** – устройство; **evaporation** – испарение; **to invent**– изобретать; **humidity** – влажность; **advance** – достижение.

Задание 2. Переведите на русский язык следующие интернациональные слова:

process, conditioner, style, form, technological, ventilation, mechanism, basic, circulate, technique, cistern, modern, electrical, start, migration.

Задание 3. Прочитайте и переведите текст.

Air conditioning is the process of altering the properties of air (primarily temperature and humidity) to more favourable conditions. More generally, air conditioning can refer to any form of technical cooling, heating, ventilation, or disinfection that modifies the condition of air.

An air conditioner (often referred to as AC) is a major home appliance, system, or mechanism designed to change the air temperature and humidity within an area, used for cooling and sometimes heating depending on the air properties at a given time.

The cooling is typically done using a simple refrigeration cycle, but sometimes evaporation is used, commonly for comfort cooling in buildings and motor vehicles. In construction, a complete system of heating, ventilation and air conditioning is referred to as 'HVAC'.

The basic concept behind air conditioner is known to have been applied in ancient Egypt where reeds hung in windows had water trickling down.

The evaporation of water cooled the air blowing through the window, though this process also made the air more humid.

In Ancient Rome, water from aqueducts circulated through the walls of certain houses to cool them down.

Other techniques in medieval Persia involved the use of cisterns and towers to cool building during hot season.

Modern air conditioning emerged from advances in chemistry

during the 19th century, and the first large-scale electrical air conditioning was invented and used in 1911 by Willis Haviland Carrier. The introduction of residential air conditioning in the 1920s helped to start the great migration to the Sunbelt (southern regions).

Задание 4. Найдите в тексте и запомните английские эквиваленты следующих словосочетаний:

1) процесс изменения свойства воздуха; 2) охлаждение; 3) нагревание; 4) изменять температуру/влажность воздуха; 5) в зависимости от; 6) обычно для; 7) полная система отопления; 8) основное понятие; 9) древний Египет; 10) сквозь окна; 11) охлаждать; 12) другие способы; 13) крупномасштабный.

Задание 5. Расскажите на английском языке, что нового вы узнали о способах изменения состояния воздуха в жилых помещениях.

Text 2. Refrigerant Development

Задание 1. Запомните следующие слова:

fatal accident – несчастный случай со смертельным исходом; **leak** – утечка; **flammable gas** – легковоспламеняющийся газ; **to include** – включать в себя; **blend** – смесь; **direct expansion air cooler** – воздухоохладитель непосредственного охлаждения; **equipment** – оборудование; **to reduce** – сокращать; **refrigerant** – хладагент; **to phase out** – свертывать, постепенно прекращать; **air quality** – качество воздуха; **innovation** – нововведение, новая идея.

Задание 2. Переведите на русский язык встречающиеся в тексте интернациональные слова:

toxic, gas, automobile, comfort, freon, molecular, system, result, innovation, commercially, technology, atmosphere.

Задание 3. Прочитайте и переведите текст.

The first air conditioners and refrigerators employed toxic or flammable gases, such as ammonia, methyl chloride, or propane, that could result in fatal accidents when they leaked. Thomas Midgley created the first non-flammable, non-toxic chlorofluorocarbon gas, Freon, in 1928.

'Freon' is a trademark name owned by DuPont for any Chlorofluorocarbon (CFC),Hydrochloroflurocarbon (HCFC),or Hydrofluorocarbon (HFC) refrigerant, the name of which including a number indicating molecular composition (R-11,R-12,R-22,R-134A).

The blend most used in direct-expansion home and building comfort is an HCFC known as R-22. It was to be phased out for use in new equipment by 2010, and is to be completely discontinued by 2020.

Several no-ozone-depleting refrigerants have been recovered from other air-conditioner systems. Non-ozone-depleting refrigerants have been developed as alternatives, including R-410A, invented by Honeywell in Buffalo. It was first commercially used by Carrier under the brand name Puron.

Innovation in air-conditioning technologies continues and improves indoor air quality.

Reducing climate-change impact is an important area of innovation because, in addition to greenhouse-gas emissions associated with energy use, CFCs, HFCs are themselves, potent greenhouse gases when leaked to the atmosphere. For example R-22 (also known as HCFC-220 has a global warming potential about 1,800 times higher than CO2.

Задание 4. Найдите в тексте и запомните английские эквиваленты следующих словосочетаний:

1) невоспламеняющийся/нетоксичный газ; 2) торговое название; 3) структура молекулы; 4) воздухоохладитель непосредственного охлаждения; 5) новое оборудование; 6) снятый с производства; 7) хладагенты, не истончающие озоновый слой; 8) использовать в коммерческих целях; 9) качество воздуха в закрытом помещении; 10) газы, образующие парниковый эффект; 11) вероятность глобального потепления.

Задание 5. Закончите предложения, выбрав соответствующий вариант окончания:

1) Thomas Midgley created the first non-flammable, non-toxic gas…

2) Hydrochlorofluorocarbon (HCFC) is to be completely…

3) Some non-ozone-depleting refrigerants were first commercially used by Carrier under the name …

4) HCFC-22 has a global warming potential about …

a) Puron; b) Freon; c) discontinued by 2020; d) 1,800 times higher than CO2.

Text 3. Portable Units

Задание1. Запомните следующие слова:

duct – труба; **wheels** – механизм; **split** – расщепление; **hose** – шланг; **household air conditioner** – бытовой кондиционер; **pressure** – давление; **bucket** – ведро; **outdoor unit** – внешнее устройство; **permanently fixed** – неподвижно зафиксированное; **air-to-air** – воздушный; **tray** – поднос; **re-evaporate** – испарять повторно; **refrigerative** – холодильный, охлаждающий.

Задание 2. Переведите на русский язык встречающиеся в тексте интернациональные слова:

transport, form, monoblock, stop, condenser, effective, compressor, climate.

Задание 3. Прочитайте и переведите текст.

A portable air conditioner is one on wheels that can be easily transported inside a home or office. Portable air conditioners are either evaporative or refrigerative.

Portable refrigerative air conditioners come in two forms, split and hose. These compressor-based refrigerant systems are air-cooled, meaning they use air to exchange heat, in the same way as a car or typical household air conditioner does. Such a system collects water condensed from the cooled air and produces hot air which must be vented outside the cooled area; doing so it transfers heat from the air in the cooled area to the outside air.

A portable split system has an outdoor unit on wheels connected to an outdoor unit via flexible pipes, similar to a permanently fixed installed unit.

Hose systems, which can be monoblock or air-to-air, are vented to the outside via air ducts. The monoblock type collects the water in a bucket or a tray and stops when full. The air-to-air type re-evaporates water and discharges it through the ducted hose and can run continuously.

A single-duct unit uses air from within the room to cool its condenser, and then vents it outside.

A dual-duct unit draws air to cool its condenser from outside instead of from inside the room, and thus is more effective than most

single-duct units.

A typical single hosed portable air conditioner can cool a room that is 44.1 m^2 or smaller. However, single hosed units cool a room less effectively than dual hosed as the air expelled from the room through the single hose creates negative pressure inside the room.

Задание 3. Найдите в тексте и запомните следующие речевые отрезки:

1) в жилом помещении и в офисе; 2) существовать в двух видах; 3) компрессорного типа; 4) таким же образом; 5) системы шлангов; 6) соединенный при помощи; 7) прекращать работу; 8) менее эффективно; 9) создавать нежелательное давление; 10) погодные условия.

Задание 4. Расскажите на английском языке о принципах работы портативных кондиционеров.

Text 4. Uses of Air Conditioning Units

Задание 1. Запомните английские слова и словосочетания:

application – применение; **internal** – внутренний; **feasible** – реальный; **external** – внешний; **to determine conditions** – определять условия; **humidity** – влажность; **wind speed** – скорость ветра; **structural impact** – конструктивное воздействие; **vehicle** – средство передвижения; **to depend on** – зависеть; **to provide** – обеспечивать; **size** – размер; **to divide** – классифицировать.

Задание 2. Переведите на русский язык встречающиеся в тексте интернациональные слова:

comfort, ventilation, commercial, sports stadiums, transport, temperature, category.

Задание 3. Прочитайте и переведите текст.

Air-conditioning engineers broadly divide air-conditioning applications into what they call comfort and process applications.

Comfort applications aim to provide a building indoor environment that remains relatively constant despite changes in external weather conditions or in internal heat loads.

Air conditioning makes deep plan building feasible, for otherwise they would have to be built narrower or with light wells so

that inner spaces received sufficient outdoor air via natural ventilation. Air conditioning also allows buildings to be taller, since wind speed increases significantly with altitude making natural ventilation impractical for very tall building.

Comfort applications are quite different for various building types and may be categorized as:

- low-rise residential buildings, small apartment buildings;
- high-rise residential buildings, apartment blocks;
- commercial buildings which are built for commerce including offices, malls, shopping centers;
- industrial spaces where thermal comfort of workers is desired;
- sports stadiums.

The structural impact of an air conditioning unit will depend on the type and size of the unit.

In addition to buildings, air conditioning can be used for many types of transportation, including motor-cars, buses and other land vehicles, trains, ships, aircraft, and spacecraft.

Process applications aim to provide a suitable environment for a process being carried out, regardless of internal heat and humidity loads and external weather conditions. It is the needs of the process that determine conditions, not human preference.

Задание 3. Найдите в тексте английские эквиваленты следующих словосочетаний:

1) инженер по вентиляции и кондиционированию; 2) кондиционирование воздуха; 3) климат внутри помещения; 4) внутреннее пространство; 5) достаточное количество свежего воздуха; 6) посредством естественной вентиляции; 7) жилые дома; 8) крупный торговый комплекс; 9) конструктивное влияние; 10) предпочтение.

Задание 4. Закончите предложения, выбрав соответствующий вариант окончания:

1.Air conditioning also allows building … .

2. Comfort applications are quite different for various building types and … .

3.The structural impact of an air conditioning unit will depend on … .

4.It is the needs of the process that determine … .

a)conditions; … b)to be taller; c)may be categorized as; d)the type and size of the unit.