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**Санкт-Петербургский горный университет**

**Кафедра иностранных языков**

# ТЕХНИЧЕСКИЙ ИНОСТРАННЫЙ ЯЗЫК
# АНГЛИЙСКИЙ ЯЗЫК

## ЭКСПЛУАТАЦИЯ ТРАНСПОРТНО-ТЕХНОЛОГИЧЕСКИХ МАШИН И КОМПЛЕКСОВ

***Методические указания к практическим занятиям для студентов магистратуры направления 23.04.03***

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# ENGLISH FOR SPECIFIC PURPOSES

## TRANSPORT AND TECHNOLOGICAL MACHINES OPERATION AND MAINTENANCE

**САНКТ-ПЕТЕРБУРГ**
**2019**

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**ТЕХНИЧЕСКИЙ ИНОСТРАННЫЙ ЯЗЫК. АНГЛИЙСКИЙ ЯЗЫК. Эксплуатация транспортно-технологических машин и комплексов:** Методические указания к практическим занятиям / Санкт-Петербургский горный университет. Сост. *В.А. Спиридонова.* СПб, 2019. 32 с.

Предлагаемый аутентичный материал направлен на совершенствование навыков и умений, необходимых студентам магистратуры для решения различных коммуникативных задач в профессиональной деятельности.

Методические указания предназначены для студентов магистратуры направления 23.04.03 «Эксплуатация транспортно-технологических машин и комплексов» (программа «Управление технической эксплуатацией автотранспортных средств, технологических машин и оборудования») и согласованы с программой по иностранному языку для студентов неязыковых вузов.

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## ПРЕДИСЛОВИЕ

Данные методические указания предназначены для учебно-методического сопровождения курса английского языка для студентов неязыковых вузов, обучающихся по направлению подготовки 23.04.03 «Эксплуатация транспортно-технологических машин и комплексов. Управление технической эксплуатацией автотранспортных средств, технологических машин и оборудования».

Методические указания состоят из нескольких тематических разделов, посвященных описанию транспортных средств и технологических машин, основных материалов и оборудования, используемых при их эксплуатации и обслуживании, а также включает описание должностных обязанностей для будущих специалистов в данной предметной области. Разработанный комплекс заданий составлен на материале аутентичных технических и публицистических текстов и аудиовизуальных материалов. Упражнения направлены на активизацию когнитивной деятельности обучающихся, освоение нового лексического материала и развитие коммуникативных навыков в сфере профессионального общения на английском языке.

## UNIT 1

### Automobile industry

**Task 1**

**In mini groups, brainstorm as many words connected to the topic as you can.**

**Task 2**

**Scan the text. Answer the question: What became the turning point for the automobile industry? Name the key inventions in the history of automobile industry.**

An automobile (or automotive) is a vehicle that is capable of propelling itself. Since seventeenth century, several attempts have been made to design and construct a practically operative automobile. Today, automobiles play an unimaginable role in the social, economic and industrial growth of any country. After the introduction of internal combustion engines, the automobile industry has seen a tremendous growth.

The turn of the twentieth century witnessed the dawning of the automobile industry. Tinkering by bicycle, motorcycle, buggy, and machinery entrepreneurs in Europe and the United States led to the first prototypes of automobiles in the late nineteenth century. French woodworking machinery makers Rene Panhard and Emile Levassor built their first car in 1890 with an engine designed in Germany by Gottlieb Daimler and Wilhelm Maybach. Armand Peugeot, a French bicycle maker, licensed the same engine and sold his first four lightweight cars in 1891. German machinist Carl Benz followed the next year with his four-wheeled car and in 1893 Charles and Frank Duryea built the first gasoline-powered car in the United States. Ransom Olds is credited as the first mass producer of gasoline-powered automobiles in the United States, making 425 “Curved Dash Olds” in 1901. The first gasoline-powered Japanese car was made in 1907 by Komanosuke Uchiyama, but it was not until 1914 that Mitsubishi mass-produced cars in Japan.

**Task 3**

**Fill in the table. Form a missing noun, verb or adjective from the following words where possible.**

| Noun | Verb | Adjective |
|---|---|---|
| | *propel* | |
| | | *capable* |
| | *construct* | |
| | | *operative* |
| *combustion* | | |
| | | *unimaginable* |
| *introduction* | | |
| | *design* | |
| *producer* | | |
| | *power* | |

**Task 4**

**Read the text again. Find the English equivalents for the following words and phrases:** *транспортное средство, приводить в действие, двигатель внутреннего сгорания, мастерить, предприниматель, получить лицензию / запатентовать, проектировать / конструировать, механик.*

## 1.1. Classification of Vehicles

**Task 1**

**Translate these words and phrases into Russian:** *capacity, goods vehicle, fuel, transmission, steering wheel, steam engine, heavy motor vehicle, medium vehicle, petrol, hydrogen, solar.*

**Task 2**

**Study the table. What other criteria can you add to this list?**

Automobiles can be classified according to several criteria presented in the following table:

| Criteria | Types of vehicles |
|---|---|
| Purpose | **passenger** / **goods** vehicles |
| Capacity | - **heavy motor** vehicle (HMV)<br>- **light motor** vehicle (LMV)<br>- **medium** vehicle |
| Fuel source | - **petrol** / **diesel** / **steam** engine vehicles<br>- **gas** / **solar** / **hydrogen** / **electric** vehicles<br>- **hybrid** vehicles<br>- **hybrid electric** vehicle (HEV) |
| Transmission | - **automatic** transmission vehicles<br>- **conventional** transmission vehicles<br>- **semi-automatic** transmission vehicles |
| Number of wheels | **Two** / **three** / **four** / **six** wheeler |
| The side of drive | **Left hand** / **right hand** position of steering wheel |

**Task 3**

**Classify the following vehicles according to the criteria given in the table:** large trucks, Jaguar C-X75, scooters, auto rickshaws, Honda FCX Clarity, steamboat, Toyota Prius, Jeeps, mini buses.

**Task 4**

**Before watching Video 1, match the English words with their Russian equivalents**

| | |
|---|---|
| a. engine block | 1. отделка салона |
| b. tremendous | 2. парк (автомобилей) |
| c. clutch | 3. разнообразие |
| d. apply | 4. коробка передач |

| | |
|---|---|
| e. brake | 5. блок цилиндров |
| f. embellishment | 6. наносить (покрытие) |
| g. fleet | 7. потрясающий, грандиозный |
| h. interior trim | 8. тормозной механизм |
| i. contribution | 9. сцепление (муфта) |
| j. gear box | 10. декоративное изображение |
| k. diversity | 11. вклад |

**Task 5**

**Watch Video 1 "Top Gear. Tribute to British Automobile Manufacturing" and discuss the following:**

1. What types of vehicles are produced in the UK nowadays?
2. What is the state of automobile industry in Russia?
3. What types of vehicles have you operated so far?
4. What type of vehicle would you like to operate? Why?

## 1.2. Types and functions of engines and motors

**Task 1**

**Read part 1 of the text and answer the questions:**

1. What is the difference between an engine and a motor?
2. What types of engines can you name?
3. What is thrust, a couple, twisting force, bhp?
4. What is torque calculated in?

### Part 1

The term engine usually refers to petrol engines, diesel engines and jet engines (or jets). In engineering, motor usually means electric motor – but in general language, 'motor' can also refer to petrol and diesel engines. Engines and motors power (or drive) machines by generating rotary motion – for example, to drive wheels. In jet engines, compressors and turbines rotate to generate thrust - pushing force, produced by forcing air from the back of the engine at high velocity.

As an engine produces a couple – rotary force - the moving parts of the machine it is driving will produce resistance, due to friction and other forces. As a result, torque (twisting force) is exerted on the output shaft of the engine. Torque – calculated as a turning moment, in newton metres – is therefore a measure of how much rotational force an engine can exert. The rate at which an engine can work to exert torque is the power of the engine, measured in watts. Although engineers normally calculate engine power in watts, the power of vehicle engines is often given in brake horsepower (bhp). This is the power of an engine's output shaft measured in horsepower (hp).

**Task 2**

**Read part 2 and fill in the gaps with the following words:** *battery, turbine, combustion, and piston.*

**Part 2**

**Petrol and diesel engines** are internal (1) ……. engines. This means they are driven by the burning of fuel in enclosed, sealed spaces called (1) ……. chambers. In petrol and diesel engines, the (1) ……. chambers are cylinders surrounded by a cylinder block and closed at the top by a cylinder head. Each cylinder contains a (2)…… .

The number of (2) …….. cylinders in an engine varies - engines in small motorcycles have only one, while sports car engines may have twelve. Fuel is supplied to each cylinder from a tank. In most engines, the flow of fuel is generated by a pump, which forces it – at high pressure – through fuel injectors. These vaporize the fuel, allowing it to mix with air. Using this mixture (of fuel and air), most engines function as four-stroke engines. This means they work on a cycle of four stages – or four strokes. A stroke is an upward or downward movement of a (2)…….

**Electric motors** are quiet and produce no pollution when in use. They also generate their maximum torque at zero revs, giving greater acceleration from standstill.

Servicing requirements for the motor are minimal, but the downfall is that a substantial (3) …… is required to provide the power for the motor. This (3) …… is heavy, expensive and causes great

environmental impact in both production and disposal at the end of its relatively short life. Even with modern advances in (3) …… technology, the range it provides for a vehicle is still short (reduced still further by higher load and speed) and it takes a long time to recharge it.

The cost of fuel saved is replaced by the cost of electricity required to charge the (3) ……, and the pollution emission is merely transferred from the vehicle to the power station if fossil fuel is used to generate the electricity. Full electric power may be viable for small vans operating over short ranges in urban areas, but this is not yet an option for longer distance and heavier vehicles.

A **hybrid** power unit is simply a combination of a spark or compression ignition engine and an electric motor. The two can work together in a variety of ways. The (3) …… can also be charged by the energy generated when the vehicle slows down (regenerative braking). Hybrid power units reduce fuel consumption and polluting emissions, but there is the extra weight and cost of the (3) …… to factor in.

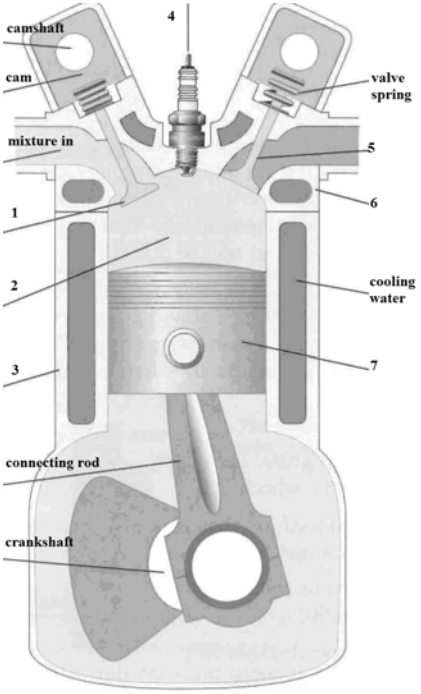
A **gas (4) …….** is basically a **jet engine** that drives an output shaft rather than providing thrust through a stream of hot gasses. Gas (4) ……..s have been used to power experimental road vehicles for more than 50 years and several manufacturers have produced prototype heavy goods vehicles, although there are not thought to be any in current production. (4) ……..s are smoother than piston engines, can run on a wide range of fuels with a high power-to-weight ratio, reduced fuel consumption and maintenance, and significantly lower nitrogen oxide and particulate emissions.

**Task 3**

**Read both parts of the text again. Find the English equivalents for the following words and phrases:** *искровое зажигание, воспламенение от сжатия, электрическая дуга, единица мощности, легкое топливо, сгорание топлива, крутящий момент, легковоспламеняющийся, жёсткий допуск, расход топлива, ударная волна, срок службы, рекуперативное торможение, выходной вал, удельная мощность (двигателя на единицу массы); выделение твёрдых частиц с отработавшими, выхлопными газами.*

**Task 4**

**Look at the cross-section of one cylinder of a four-stroke internal combustion engine; label it using the following words and expressions:** *intake valve, exhaust valve, piston, spark plug, combustion chamber, cylinder head, and cylinder block.* **Then translate them into Russian.**




**Task 5**

**Watch Video 2 "7 Strangest New Engines". In groups, design a machine for one of the engines, describe its key characteristics, and make a poster presentation.**

## UNIT 2

## Materials and Tools

### 2.1. Classification and standards

**Task 1**

**Translate the words into Russian:** *grease, jointly, lubrication, chassis, wheel bearing, severe duty, respectively, consistency, assign, property, versatile, wear, rust, oxidation, load, moly, backhoe, front end loader, still mill.*

**Task 2**

**Read the text and answer the questions:**

1. When was the standard classification and specification for automotive service first published?
2. What greases does it categorize?
3. What is the measure of the consistency of greases expressed by?

Jointly developed by ASTM* International, the National Lubricating Grease Institute (NLGI) and SAE** International, standard ASTM D4950 *"standard classification and specification for automotive service greases"* was first published in 1989 by ASTM International. It categorizes greases suitable for the lubrication of chassis components and wheel bearings of vehicles, based on performance requirements, using codes adopted from the NLGI's *"chassis and wheel bearing service classification system"*:

- LA and LB: chassis lubricants (suitability up to mild and severe duty respectively)
- GA, GB and GC: wheel-bearings (suitability up to mild, moderate and severe duty respectively)

A given performance category may include greases of different consistencies. The measure of the consistency of grease is commonly expressed by its NLGI consistency number.

The main elements of standard ATSM D4950 and NLGI's consistency classification are reproduced and described in standard SAE J310 *"automotive lubricating greases"* published by SAE International.

Standard ISO 6743-9 *"lubricants, industrial oils and related products (class L) — classification — part 9: family X (greases)"*, first released in 1987 by the International Organization for Standardization, establishes a detailed classification of greases used for the lubrication of equipment, components of machines, vehicles, etc. It assigns a single multi-part code to each grease based on its operational properties (including temperature range, effects of water, load, etc.) and its NLGI consistency number.

*American Society for Testing and Materials - Американское общество по испытанию материалов

** Society of Automotive Engineers - Общество автомобильных инженеров (США)

**Task 3**

**Watch Video 3 "Which Grease Should I Use?"**

**Answer the following questions:**

1. What should you bear in mind when selecting a grease?
2. What does NLGI number 1 or number 2 mean?
3. What does "NLGI GC-LB certified" mean?
4. When is a general purpose greases used?
5. What is moly added to a grease for?
6. What are the advantages of full-synthetic greases?

**Task 4**

**Watch Video 3 again and decide which type of grease will suite in each case:**

a) Low-speed bearings with frequent relubrication?
b) Chassis lube points on tractors?
c) Garage doors?
d) Truck fifth wheels?
e) Where dirt and dust may be present?
f) Agriculture and construction equipment?

## 2.2. Mechanical fasteners

**Screws** have threaded shafts with heads. They may be screwed into a predrilled hole – drilled for the screw to enter. Self-tapping screws do not require predrilled holes. They cut their own hole as they are screwed in. Unlike bolts, screws are not used with nuts and – generally – are not screwed into threaded holes. Most screw heads are designed to be screwed in using a screwdriver. The most common types are slot head screws and crosshead screws.

**Rivets** are permanent fasteners – they cannot be unscrewed. A solid rivet consists of a short, solid shaft of metal with a head at one end, called the factory head. The rivet is inserted through a pre-drilled hole, then a special tool is used to deform (change the shape of) the other end of the rivet, flattening and widening it to form a second head, called the shop head. Solid rivets are widely used in aircraft. Blind rivets (or pop rivets) are made from hollow tubes, and are fitted using a tool called a rivet gun. Blind rivets are not suitable for high-strength joints.

**Task 1**
**Match the descriptions (1-5) to the terms (a-e).**

| | |
|---|---|
| 1. a type of fastener that is hollow | a. rivet gun |
| 2. a type of fastener that is not hollow | b. shop head |
| 3. a tool used for installing a type of fastener | c. factory head |
| 4. the wide part at the top of a rivet, present when the rivet is supplied | d. solid rivet |
| 5. the wide part at the bottom of a rivet, formed after the rivet is inserted | e. blind rivet |

**Task 2**
**Watch Video 4 “Every Toolbox Should Have These”.**
**Name top-5 tools and specify their field of application?**

## 2.3. Non-mechanical joints

**Task 1**
**Read the paragraph. Describe the process of welding?**

**Welding** means permanently joining two pieces of material by heating the joint between them. The heat melts the edges of the components being welded together, and once the material has become molten (liquid), fusion occurs. When the joint fuses, material from each component is mixed together, joining to form a solid weld. Metal is often welded. It is also possible to weld plastic.

**Task 2**
**Complete the extract from a technical document about welding using the words in the box. You will need to use some words twice.**

| |
|---|
| base, discontinuities, dissimilar, fuse, heat-affected, materials, metal, molten, pool, residual, stresses, together, weld, welded, zone |

It is possible for components made of different metals to be (1)..... ..... . For instance, steel can be welded to copper and to brass. However, it is much more difficult to weld components made of two (2)..... ..... than it is to weld those made of the same (3)..... ..... While there is no difficulty in melting two different metals and mixing them together in a (4)..... state, problems occur once the hot, liquid metal forming the (5)..... ..... starts to cool. As this process takes place, the two metals will not necessarily (6)..... properly. Once the joint has cooled, this can result in (7)..... , such as cracks, at the heart of the (8)..... ..... In addition, as the metals contract at different rates (due to different coefficients of thermal expansion), powerful (9)..... ..... can build up, not only in the joint, but also in the wider (10) …..... ..... near the joint

**Task 3**

**Read the text about common gas and arc welding techniques.**

Shielded metal arc welding (SMAW), generally called arc welding or stick welding, involves striking an electric arc between the workpiece and an electrode – an electrical conductor. The heat from the arc melts the base metal. The electrode consists of a welding rod – a stick of metal of the same type as the workpiece – which provides filler. The welding rod is therefore consumable – it is used up. The rod is also coated with a material called flux. When heated, this produces a shielding gas, which protects the molten metal from oxygen. Without this gas, the hot metal would combine with the oxygen in the air, and this would weaken the weld.

In gas welding, heat comes from a torch which burns oxyfuel – a mixture of oxygen (02) and a gas fuel. The gas fuel burns much hotter in oxygen than it would in the air. The most common fuel is acetylene (C2H2) called oxyacetylene when mixed with oxygen. Welding rods provide filler but flux is not required, as the burning oxyfuel produces carbon dioxide (C02) which acts as a shielding gas.

In gas metal arc welding (GMAW) – often called MIG welding (Metal Inert Gas) – an arc is struck between the workpiece and a wire which is made of the same metal as the base metal. The wire acts as a consumable electrode, supplying filler. A shielding gas, often argon (Ar), is blown onto the weld pool.

In gas tungsten arc welding (GTAW) – often called TIG welding (Tungsten Inert Gas) – an arc comes from an electrode made of tungsten (W). However, the tungsten is non-consumable – it does not melt, and is not consumed as filler during the welding process. A separate welding rod is used to supply filler, if required. As with MIG welding, a shielding gas such as argon is blown onto the weld.

**Task 4**

**Match the two parts to make eleven correct sentences about welding techniques. You will need to use some parts more than once.**

**1.** Shielded metal arc welding uses
**2.** Gas welding uses

**3.** Gas metal arc welding uses
**4.** Gas tungsten arc welding uses
**a)** burning gas.
**b)** a consumable electrode.
**c)** a non-consumable electrode.
**d)** a separate welding rod which is not an electrode.
**e)** a special coating on the welding rod which produces a shielding gas.
**f)** a separate gas supply, blown onto the weld as a shielding gas.
**g)** a shielding gas generated by burned oxyfuel.
**h)** a gas whose purpose is to increase the temperature of the welding process.

**Task 5**

**Choose the correct words from the brackets to complete the sentences about adhesives.**

**1.** Surfaces can be glued together by applying different types of *(adhesive \ adhesion)*.
**2.** When adhesive-covered surfaces touch, they *(adhere to \ apply to)* each other.
**3.** If an adhesive reacts with the material which the components are made from, it forms a *(chemical bond \ mechanical bond)* with the material.
**4.** An adhesive that is applied to the surfaces of both components, then allowed to dry before they are joined, is called a *(contact adhesive \ two-part adhesive)*.
**5.** In order to form an effective mechanical bond, an adhesive must be absorbed quite deeply into the *(solvent \ substrate)* of the material.
**6.** When two-part adhesives are mixed, they react chemically, which enables them to *(cure \ evaporate)* and form a hard, strong material.

## UNIT 3

## Maintenance Management

**Task 1**
**Read the text. In pares, answer the questions:**
1. What is maintenance?
2. Give a synonymous phrase for “operational life”.
3. What kind of maintenance is required for belts, or alignment?

Past and current maintenance practices in both the private and government sectors would imply that maintenance is the actions associated with equipment repair after it is broken. The dictionary defines maintenance as “the work of keeping something in proper condition, upkeep.” This would imply that maintenance should be actions taken to prevent a device or component from failing or to repair normal equipment degradation experienced with the operation of the device to keep it in proper working order. Nothing lasts forever and all equipment has associated with it some predefined life expectancy or operational life.

The design life of most equipment requires periodic maintenance. Belts need adjustment, alignment needs to be maintained, proper lubrication on rotating equipment is required, and so on. In some cases, certain components need replacement, *e.g.*, a wheel bearing on a motor vehicle, to ensure the main piece of equipment (in this case a car) last for its design life.

Good maintenance is important for worker safety. Large machinery maintenance, for instance, can be dangerous. It is often conducted in close contact with running machinery. The conditions can be closely confined and unhealthy. The work is non-routine and subject to human error. There is often time pressure involved as well. The Occupational Safety and Health Administration (OSHA)* reports that 15 to 20 percent of industrial accidents and 10 to 15 percent of all fatal industrial accidents are related to maintenance operations.

*Управление охраны труда (Министерства охраны труда США)

**Task 2**

**Use the text to match the parts of these collocations. Translate them into Russian.**

| | |
|---|---|
| 1. design | a. bearing |
| 2. life | b. safety |
| 3. human | c. life |
| 4. wheel | d. pressure |
| 5. time | e. error |
| 6. worker | f. expectancy |

## 3.1. Types of Maintenance Management

Different approaches have been developed to know how maintenance can be performed to ***ensure*** equipment reaches or ***exceeds*** its design life. In addition to waiting for a piece of equipment to fail (reactive maintenance) the other approaches are preventive maintenance, predictive maintenance, or reliability centered maintenance.

**Task 1**

**Watch video 5 "From Reactive to Proactive Maintenance", read part 1 of the text and say what reactive maintenance is, and why it isn't sufficient?**

**Part 1**

**Breakdown (Reactive) Maintenance** is basically the 'run it till it breaks' maintenance mode. No actions or efforts are taken to maintain the equipment as the designer originally intended to ensure design life is reached.

Advantages to breakdown maintenance can be viewed as a double-edged sword. If we are dealing with new equipment, we can expect minimal incidents of ***failure***. If our maintenance program is purely reactive, we will not ***expend*** manpower or ***incur*** capital cost until something breaks.

**Task 2**

**Watch video 6, read part 2 of the text and say what preventive maintenance is, and why it is essential.**

**Part 2**

**Preventive Maintenance** can be defined as, "actions performed on a time or machine-run-based schedule that detect, ***preclude***, or ***mitigate*** degradation of a component or system with the aim of ***sustain****ing* or extending its useful life through controlling degradation to an acceptable level." Preventive maintenance is a means to increase the reliability of their equipment and ***preserve*** its value. It also ensures the availability of the machinery and thus ***lessen****s* the risks that technicians face in ***on-site*** repairs. Accidents in the workplace are also significantly reduced.

Early detection of problems allows repairs to be made before the situation ***worsen****s*. Machinery that does not need to be taken offline for extensive repairs will avoid production interruptions. Regular inspections and analysis can be used to predict and prevent component failures that may create safety hazards and machinery breakdowns.

**Task 3**

**Watch video 7, read part 3 of the text and say what predictive maintenance is, and how we can harness it.**

**Part 3**

**Predictive Maintenance** can be defined as "measurements that detect the onset of a degradation mechanism, thereby allowing causal stressors to be ***eliminated*** or controlled prior to any significant ***deterioration*** in the component physical state. Results indicate ***current*** and future functional capability".

Predictive maintenance differs from preventive maintenance by basing maintenance need on the actual condition of the machine rather than on some preset schedule. Predictive maintenance is used to define needed maintenance task based on quantified material/equipment condition.

**Task 4**

**Read part 4 of the text and say what RCM is**.

**Part 4**

**Reliability centered maintenance** (RCM) is defined as "a process used to determine the maintenance requirements of any physical asset in its operating context". RCM is highly ***reliant on*** predictive maintenance but also recognizes that maintenance activities on equipment that is inexpensive and unimportant to facility reliability may best be left to a reactive maintenance approach. The following maintenance program breakdowns of continually top-performing facilities would echo the RCM approach to ***utilize*** all available maintenance approaches with the predominant methodology being predictive (<10% reactive, 25% - 35% preventive, 45% - 55% predictive).

In a nutshell, RCM is a systematic approach to evaluate a facility's equipment and resources to best mate the two and result in a high degree of facility reliability and cost-effectiveness.

**Task 5**

**Discuss with your partner.**

What are the advantages and disadvantages of each method? Fill in the table.

| **Types of Maintenance** | **Advantages** | **Disadvantages** |
|---|---|---|
| Reactive | | |
| Preventive | | |
| Predictive | | |

**Task 6**

**Look through the whole text again. Match the words in bold italic with their definitions:**

a. (verb) make (something bad) less severe, serious, or painful;
b. (verb) make practical and effective use of;
c. (verb) maintain (something) in its original or existing state
d. (adjective) happening or being used or done now;

e. (adjective + adverb) taking place or available on a particular site or premises;

f. (noun) the action or state of not functioning;

g. (verb) completely remove or get rid of (something);

h. (verb) make certain that something happens.

i. (verb) strengthen or support;

j. (mass noun) the process of becoming progressively worse;

k. (verb) serve as a prelude or introduction to

l. (verb) spend or use up (a resource)

m. (verb + adjective + preposition) to need or depend upon something in order to be able to do something;

n. (verb) become subject to something unwelcome or unpleasant as a result of one's own behaviour or actions.

o. (verb) diminish;

p. (verb) be greater in number or size than (a quantity, number, or other measurable thing).

### 3.2. Five Tips for Large Machinery Maintenance

**Task 1**

**Read the text. Match paragraphs A-E with the titles 1-5**

1. Keep Daily Records of Use and Oversee Operation
2. Maintain a Schedule of Planned Maintenance
3. Lubricate and Clean Frequently
4. Inspect and Monitor Components for Wear and Damage
5. Protect Equipment during Storage

**A.** Large machinery should be stored under cover whenever possible. Motors, turbines, mixers and other equipment should be rotated frequently. Inspect idle machinery for rust, condensation and contamination. Oil-mist lubrication is a good solution for the damaging effects of warm and humid environments.

**B.** Working heavy machinery requires daily maintenance. Some components, especially moving parts in engines and power trains, demand frequent lubrication. Other components, such as hydraulic lifts and bearings, must be monitored and lubricated at the first sign of need.

Contamination can lead to machinery breakdown. Water is a major source of corrosion. Lubrication prevents corrosion. Maintaining seals and replacing filters will help keep lubricants free of contaminants.

**C.** Check belts, pulleys and chains for alignment and condition. Inspect gears and sprockets for broken teeth, cracks and misalignment. Fluid analysis should also be part of a regular maintenance schedule. Analysis of used lubricants and other fluids is an excellent way to diagnose problems and prevent machinery wear and breakdown. Identifying contaminants in the fluids can lead analysts to the source of wear and damage.

**D.** Establish forecasts for the expected life of all components and replace them on schedule. Part replacement must be done by knowledgeable technicians. Bearings are key components of heavy machinery equipment and can be easily damaged or worn. Bearing housings should be regularly maintained, including inspection for corrosion and wear, and replaced when necessary. A maintenance log should also be kept to ensure regular checks are not missed and compliance is measured.

**E.** Large machinery wear and breakdown are often made worse by unskilled handling. Keeping records of machinery use and monitoring daily operations can help pinpoint when and where the machinery is being used by inadequately skilled operators. A new way to oversee the operations of large machinery is via GPS. The device tracks movement and records it in digital records, which are organized to be easily retrieved.

## UNIT 4

## Leading companies and careers

### 4.1. Tesla

**Task 1**

**Read the company description. Imagine you have a company of your own, give it a name and write a similar description.**

Tesla is accelerating the world's transition to sustainable energy. We design, manufacture, sell and service the world's best solar technology, energy storage systems, and electric vehicles, providing customers the opportunity to generate, store and consume energy entirely sustainably.

Tesla is committed to hiring and developing top talent from around the world for any given discipline. Based in California, Tesla's workforce spans across four continents. We work to build an inclusive environment in which all people, regardless of gender, race, religion, or background, can come to do their best work.

Our world-class teams operate with a non-conventional philosophy of inter-disciplinary collaboration. Each member of the team is expected to challenge and to be challenged, to create, and to innovate. We're tackling the world's most difficult and important problems – and we wouldn't succeed without our shared passion for making the world a better place.

### 4.2. Equipment Maintenance Technician

**Task 1**

**Read and translate this job description.**

**Responsibilities:**

- Perform Preventative Maintenance (PM) on all industrial production and mechatronics equipment;
- perform Corrective Maintenance (repairs) on a wide array of production equipment to include: electrical systems ranging from 24 VDC to 480

VAC 3 phase, mechanical systems, conveyance systems, hydraulic systems, pneumatic systems, PLC, robotics;
- diagnose and troubleshoot industrial production and mechatronics equipment through root cause analysis;
- perform Condition Based Maintenance: use variety of analytics including thermography (thermal camera), vibration analysis, and oil analysis.

**Requirements:**
- Minimum High School Diploma or equivalent;
- Fluency with common MS Office programs (Word, Excel, PowerPoint, Project) and experience using a CMMS (Computerized Maintenance Management Program) or similar application;
- Experience in two or more of the following areas:
At least one year of professional or military work experience in these areas: Production line equipment maintenance or repair (Electrical and/or Mechanical), PLC programming and/or troubleshooting, Robotics – servo repairs, recover faults;
- Bachelor/Associate Degree or Certification in Robotics/PLC Programming or Skilled Trades (Electrical, Mechanical, Metal Working).

**Task 2**
**Write a covering letter and a CV for this position.**

**Task 3**
**Role play:**
Student A, you are an HR manager recruiting for Tesla:
-study student B's covering letter and CV;
- ask some following up questions about his\her education, motivation and experience.
Student B, you are the one searching for the position of equipment maintenance technician:
- prepare for the interview;
- answer student A's questions.
**Then switch your roles.**

## SUPPLEMENTARY MATERIALS AND REVISION

### 1. Effects of Car Pollutants on the Environment

**Task 1**
**Read the text. Match paragraphs A-D with the titles 1-4**

**1. Human Health**
**2. Air, Soil and Water**
**3. Reducing Car Pollution**
**4. Global Warming**

Car pollutants cause immediate and long-term effects on the environment. Car exhausts emit a wide range of gases and solid matter, causing global warming, acid rain, and harming the environment and human health. Engine noise and fuel spills also cause pollution. Cars, trucks and other forms of transportation are the single largest contributor to air pollution in the United States, but car owners can reduce their vehicle's effects on the environment.

**A.** Car pollution is one of the major causes of global warming. Cars and trucks emit carbon dioxide and other greenhouse gases, which contribute one-fifth of the United States' total global warming pollution. Greenhouse gases trap heat in the atmosphere, which causes worldwide temperatures to rise. Without greenhouse gases, the Earth would be covered in ice, but burning excessive amounts of fossil fuels, such as gasoline and diesel, has caused an increase of 0.6 degrees Celsius, or 1 degree F, in global temperatures since pre-industrial times, and this will continue to rise over the coming decades. Warmer global temperatures affect farming, wildlife, sea levels and natural landscapes.

**B.** The effects of car pollution are widespread, affecting air, soil and water quality. Nitrous oxide contributes to the depletion of the ozone layer, which shields the Earth from harmful ultraviolet radiation from the sun. Sulfur dioxide and nitrogen dioxide mix with rainwater to create acid rain, which damages crops, forests and other vegetation and buildings. Oil and fuel spills from cars and trucks seep into the soil near highways,

and discarded fuel and particulates from vehicle emissions contaminate lakes, rivers and wetlands.

**C.** Particulate matter, hydrocarbons, carbon monoxide and other car pollutants harm human health. Diesel engines emit high levels of particulate matter, which are airborne particles of soot and metal. These cause skin and eye irritation and allergies, and very fine particles lodge deep in lungs, where they cause respiratory problems. Hydrocarbons react with nitrogen dioxide and sunlight and form ozone, which is beneficial in the upper atmosphere but harmful at ground level. Ozone inflames lungs, causing chest pains and coughing and making it difficult to breathe. Carbon monoxide, another exhaust gas, is particularly dangerous to infants and people suffering from heart disease because it interferes with the blood's ability to transport oxygen. Other car pollutants that harm human health include sulfur dioxide, benzene and formaldehyde. Noise from cars is also harmful, damaging hearing and causing psychological ill-health.

**D.** There are several ways that car and truck owners can reduce the effects of car pollutants on the environment. Old and poorly maintained vehicles cause most pollution from cars, but electric, hybrid and other clean, fuel-efficient cars have a reduced impact. When buying a new car, check the fuel economy and environment label. High ratings mean low pollution levels. Maximize fuel economy by removing all unneeded items, such as roof racks, and driving steadily, rather than quickly and braking hard. Keep your vehicle well-maintained, with regular tune-ups and tire checks, and leave the car at home whenever you can. Walk, bike or use public transport when possible.

**Task 2**

**Read the text again. Find the English equivalents for the following words and phrases:** *загрязняющее вещество, долгосрочный, кислотный дождь, способствовать, удерживать, ископаемое топливо, десятилетие, истощение озонового слоя, ультрафиолетовое излучение, шоссе, заболоченная территория, просачиваться, твёрдые частицы (в отработавших газах), раздражение слизистой глаз, мелкие частицы, топливо-*

*сберегающий, равномерное движение, набирать скорость, резко тормозить, расход топлива, регулировка.*

**Task 3**

**Match the words from the text with their synonyms:**

| | |
|---|---|
| 1. contaminate | a. cut down |
| 2. shield | b. increase |
| 3. reduce | c. harm |
| 4. impact | d. favorable |
| 5. interfere | e. intervene |
| 6. beneficial | f. pollute |
| 7. damage | g. influence |
| 8. rise | h. protect |

**Task 4**

**Match English chemical terms with their translation:**

| | |
|---|---|
| 1. nitrous oxide | a. диоксид серы |
| 2. carbon dioxide | b. углеводород |
| 3. oxygen | c. угарный газ |
| 4. nitrogen dioxide | d. углекислый газ |
| 5. carbon monoxide | e. кислород |
| 6. benzene | f. закись азота |
| 7. hydrocarbon | g. двуокись азота |
| 8. sulfur dioxide | h. бензол |

**Task 5**

**Choose one paragraph from the text and translate it into Russian without using a dictionary.**

**Task 6**

**Project work:** research the environmental problems caused by car pollutants in your local area. (Involve statistics and give references). Make a poster presentation.

## 2. Diesel engines

**Task 1**

**Complete the text using the following words:** *mixture, power, compression, petrol, fuel injector, torque, spark plug, piston cylinder, induction/ intake, ignition.*

Diesel engines differ from (1) ..... engines in one key respect: they are not fitted with a (2) ....., in each cylinder, to ignite the fuel. This is because when a (3) ..... of diesel and air is compressed inside a hot (4) ....., it will explode spontaneously, without the need for a spark to provide (5) ..... A diesel engine must therefore work in a way which prevents the diesel from exploding before the piston is at the top of the cylinder. To achieve this, the engine takes in only air during the (6) ..... stage of the cycle. Therefore, during the (7) ..... stage, only air- and not an air-fuel mixture - is pressurized. It is only at that last instant, when full compression has occurred, that the (8) ..... above each cylinder forces vaporized diesel into the combustion chamber, where it ignites.

Diesel engines operate at lower speeds than petrol engines, making them less suitable for high-speed applications. However, they are more able to (9) ..... heavy vehicles, as they can produce greater amounts of (10) ..... than petrol engines.

**Task2**

**Think about an engine in a vehicle you're familiar with. Describe its specific aspects: the type of fuel it uses, the number of cylinders it has, and how much power and torque it produces.**

## 3. Types of greases

**Task 1**

**Read the text. Compare the characteristics of different greases. Make a report on one of the grease types.**

**Aluminum Complex Grease** has good high temperature characteristics, with a dropping point approximately 500°F, excellent water tolerance, good shear stability, and responds very well to additive treatments that enhance performance capabilities, such as oxidation and rust inhibition. Frequently used in lubricating food machinery.

**Bentone Grease** is treated with a polar activator that will give an electrical charge to the clay particles, thus aligning them to hold the lubricating oil in suspension in a non-soap thickened, grease structure. Not very compatible with other greases, since the electrical charge may be destroyed and soften the grease beyond performance limits. This type of product is often called a No-Melt grease. It has good water resistance, low temperature pump ability and extremely high temperature applications where a non-melting grease is required, the clay structure can aid in setting up a self-forming oil seal where bearing seals are impossible to maintain such as in wheel bearings on high temperature kiln cars.

**Calcium Grease** is manufactured by using hydrated lime and a fatty material. Calcium grease must be used in a lower temperature environment, since they are limited to approximately 150°F. Higher temperatures may alter the grease structure.

**Lithium Grease** is a multi-purpose type of grease which has a buttery texture and its dropping point is above 350°F. It can be used with occasional temperatures up to 300°F. Lithium grease has excellent resistance to water and breakdown, or softening, by working. Pump ability is a very strong characteristic for this type of grease.

**Polyurea Grease** is a grease of fairly recent development that does not use a conventional soap thickener. This type of grease has a high dropping point, approximately 470°F, has an ashless structure, excellent water resistance, pumpability and provides superb high temperature bearing life. It is often used in electric motors, alternators and in food machinery. Some Polyurea greases are very shear sensitive, that is, they will soften in dispensing and harden in the bearings.

**Sodium Grease (Soda Soap)** is generally fibrous-textured, stringy grease that has been used as a standard wheel bearing grease for many years. Dropping points will vary between 300–400°F, and have

good shear stability. A low-cost grease that has good rust protection, but very poor water resistance.

**Task 2**

**Find the English equivalents for the following Russian words and word phrases:** *водостойкость (2), прочность на сдвиг, улучшать, рабочие характеристики, окисление, замедление ржавления, прокачиваемость (жидкости), сальник, гашёная известь, температура каплепадения.*

## 4. New and emerging technologies in preventive maintenance

**Task 1**

**Read and translate the text.**

There are a host of other technologies that can help you build or improve your preventive maintenance strategy. These technologies can be utilized with or without the solutions mentioned above, and can address certain crucial elements of preventive maintenance.

**3D printing** can be valuable for creating spare parts that are needed, but not readily available, and build molds or tooling used in manufacturing spare parts.

**Embedded sensors** on equipment can provide information about the condition and performance of assets, such as temperature, vibration and volume. The data is used to spot early stages of disrepair and prompt intervention.

**Virtual reality** and augmented reality can help train new technicians and improve on-the-job performance. VR and AR allow technicians to practice in a safe environment, cut their learning curve, reduce the cost of training, and speed up repairs.

**Video transmissions** are helpful in training circumstances and tricky repair situations while wearable technology allows technicians to scan equipment, relay messages, make notes, and call for help, and access instructions from anywhere.

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6. Video 6 https://www.youtube.com/watch?v=834eGk_yTvc
7. Video 7 https://www.youtube.com/watch?v=ACH1uqdhU_o

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# ТЕХНИЧЕСКИЙ ИНОСТРАННЫЙ ЯЗЫК
# АНГЛИЙСКИЙ ЯЗЫК

## ЭКСПЛУАТАЦИЯ ТРАНСПОРТНО-ТЕХНОЛОГИЧЕСКИХ МАШИН И КОМПЛЕКСОВ

***Методические указания к практическим занятиям для студентов магистратуры направления 23.04.03***

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# ENGLISH FOR SPECIFIC PURPOSES

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