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ОБЖ часть

Content

4 LABOR SAFETY AND ENVIRONMENTAL IMPACT

Modern production must be characterized by safe working conditions, since in any civilized society the person is one of the greatest value. The development of any civilization is associated with the improvement of production processes in various sectors of the economy.

The concept of labor protection reflects the main directions of functioning of the system of preserving the life and health of workers in the process of their work. This system includes legal, socioeconomic, organizational, technical, sanitary and hygienic, therapeutic and preventive, rehabilitation and other measures that (individually or in aggregate) are aimed at creating of labor conditions that meets the requirements of preserving the lives and health of workers in the course of their work activities.

4.1 General information on the labor protection of the enterprise.

A safe work environment is a productive one. No matter the size or type of the business, procedures for safety in the workplace are a necessity for all staff. Safety measures protect employees as well as equipment and business property. Avoiding or minimizing injuries and damage to equipment and facilities will result in fewer expenses and more profit for a business.

Workplace safety is very important for each and every employee in the industry because all the workers desire to work in a safe and protected atmosphere. Health and safety is the key factor for all the industries in order to promote the wellness of both employees and employers. It is a duty and moral responsibility of the company to look after the employee’s protection.

These days, workplace health and safety procedures are important for the well-being of both employees and employers because human loss is immeasurable and intolerable. As, such loss or injuries can employ major loss to the families.

4.2 Analysis of dangerous and harmful factors

Safe working conditions are working conditions under which the possible impact on the workers of harmful and hazardous production factors or levels of exposure does not exceed the established limits.

Harmful and difficult working conditions are those conditions and the nature of labor in which the adverse effects of harmful and hazardous factors cause persistent functional changes in the body work and which are characterized by an increased risk of developing the disease.

Depending on the time of exposure and the intensity of production factors can be dangerous or harmful. In the case of instantaneous actions, depending on the time of exposure and the intensity of production factors can be dangerous or harmful. In the case of snap-acting factor becomes dangerous, and prolonged exposure to it is harmful.

In accordance with the state standard of harmful and hazardous factors by the nature of their impact are divided into physical, chemical, biological and psychophysiological.

Working with computer belongs to the category of works related to hazardous and harmful working conditions. During the work with the computer the following dangerous and harmful production factors affect the users:

Physical dangerous and harmful factors include:

* moving of machines and mechanisms, unprotected movable elements of the equipment moving the work piece, construction, moving or crumble; high level of dustiness and gas contamination of air;
* high or low air temperature, surfaces, humidity, air pressure or the speed of movement of air;
* elevated levels of noise or vibration, ultrasound and ionizing radiation.
* a dangerous level of voltage in an electrical network circuit which may occur through the human body, elevated levels of static electricity, the increased strength of the electric or magnetic fields;
* missing or inadequate natural lighting, inadequate illumination of the working area, increased brightness of light, lack of contrast between the background and the object of distinction, brilliance, increased pulsation of the luminous flux, elevated levels of ultraviolet or infrared radiation;
* sharp edges, graininess and roughness of surfaces of workpieces, tools and equipment;
* the location of the workplace at a considerable height relative to the ground or floor;

Table 4.1 - Analysis of dangerous and harmful production factors

|  |  |  |
| --- | --- | --- |
| *№* | *Name of dangerous and harmful production factor* | *Types of work, equipment, technological operations in which this production factor occurs* |
| 1 | Mechanical injuries | There is a possibility of injury by touching the corner of the desktop, using kitchen utensils in the kitchen of the office and stumbling over wires |
| 2 | Noise | The source of noise can be a phone call and PC |
| 3 | Vibration | Absent |
| 4 | Increased or lowered air temperature | Absent. The enterprise has an automatic system for maintaining air temperature with the help of air conditioners and heaters. |

Continuation of Table 4.1

|  |  |  |
| --- | --- | --- |
| *№* | *Name of dangerous and harmful production factor* | *Types of work, equipment, technological operations in which this production factor occurs* |
| 5 | High humidity and air speed | Absent. The height of the cabinet is six meters. Therefore, there is no barrier to normal air circulation. |
| 6 | Severity and intensity of work | Possible neuro-psychological overload (mental overstrain, monotony of work, emotional overload) |
| 7 | Risk of electric shock | Non-closed electrical shield |
| 8 | Toxicity in the enterprise | Absent |
| 9 | Fire and explosion hazard | There is a possibility of fire and explosion hazard |
| 10 | Risk of deterioration of health | Stresses, eye strain, immobility and monotony of work |

4.3 Occupational sanitation and hygiene

Sanitary and hygienic conditions at enterprises have a great impact on human health. To these conditions include temperature regime, the humidity and purity of the air include cleanliness of premises, equipment, inventory and personal hygiene of trade workers.

To meet sanitary and hygienic requirements, in each enterprise there must be washbasins with hot and cold water supply and a mixer device. Shells should be provided with soap, electro towels, paper rolls - towels or individual napkins.

All premises of enterprises should be kept clean, for which daily thorough cleaning is necessary: wet sweeping and washing floors, dust removal, wiping furniture, radiators, window sills, washing and disinfection of sinks and toilet bowls.

Weekly with the use of detergents, it is necessary to wash the walls, lighting fixtures, to clean the glass of dust and soot. Once a month the enterprise should be closed on a sanitary day for general cleaning, disinfection of premises. Dressing rooms should be equipped with lockers or hangers for open storage of home and work clothes, a table, chairs in the required quantity, and windows have curtains and curtains. In addition, in the dressing rooms should provide a washbasin, a towel and a mirror.

Each employee must have a personal medical book with the results of all medical examinations and examinations, information on the transferred infectious diseases, on the passage of hygienic training, attestation.

Table 4.2 - Occupational sanitation and occupational health

|  |  |  |
| --- | --- | --- |
| Factor | Allowable rates | Estimation |
| Noise level+ | 0 db-80db | 80db - normal, because level does not exceed the allowable |

Continuation of Table 4.2

|  |  |  |
| --- | --- | --- |
| Factor | Allowable rates | Estimation |
| Vibration level |  | Low, because there are no obvious sources of vibration |
| Industrial lighting |  | Normal, because there are sources of artificial and natural lighting |
| Air speed | In the cold season: no more than 0,3m/s  In the warm season: 0,25m/s | In the cold season: 0,2 m/s  In the warm season: 0,21 m/s  Normal |
| Temperature | In the cold season: 19-23oC  In the warm season:18-25oC | In the cold season: 23oC  In the warm season: 21oC  Normal, because the air conditioner is used in the summer, the building is heated by a central heating system in the winter, and in the remaining seasons it is possible to ventilate the premises. |
| Humidity | In the cold season: no more than 60%  In the warm season: no more than 65% | In the cold season: 41%  In the warm season: 52%  Normal, because the office is ventilated every day and wet cleaning is conducted |
| Ventilation |  | Normal, because there is a ventilation system (natural ventilation from open windows, mechanical ventilation from blower and refrigerators) |
| Thermal radiation |  | A little above the norm, because there is a large number of personal computers emitting heat |
| Cleaning |  | Two times a day in toilets, and everyday cleaning of rooms |

4.4 Electrical safety

Electrical safety is a system of organizational and technical measures and means to protect people from the dangerous and harmful effects of electric current, electric arc, electromagnetic field and electrostatic discharges.

Organizational measures for electrical safety - the correct organization and implementation of safe working methods; training and briefing of electrical personnel; control and supervision of compliance with safety regulations, work methods; mechanization and automation of technological processes.

Technical measures for electrical safety - ensuring normal meteorological conditions in the work area, normalized illumination, applying the necessary protective measures and means; the use of safe hand-held electric machines (electric tools), as well as fences, locks of switching electrical devices, instrumentation, work clothes, special footwear, etc.

Measures to prevent electric shock include the enclosure and insulation of any parts of electrical equipment and installations that are under voltage. Also, enterprises should be organized, where it is possible and where necessary in accordance with the rules and regulations, the application of low voltage. A mandatory measure is the grounding or zeroing of all metal structures and cables, as well as the use of means of individual and collective electrical protection. Also organizational measures include measures for admission to work with electricity and supervision during the work of specialists on electrical installations.

In the room to ensure electrical safety of electrical installations in operation, along with these activities, technological protection measures, which include: current-carrying parts, neutral grounding and isolation network, reduce the voltage, dual insulation.

4.5 Fire safety

Fire safety is the set of practices intended to reduce the destruction caused by fire. Fire safety measures include those that are intended to prevent ignition of an uncontrolled fire, and those that are used to limit the development and effects of a fire after it starts.

Fire safety measures include those that are planned during the construction of a building or implemented in structures that are already standing, and those that are taught to occupants of the building.

The causes of fires can be violation of technological processes and problems, in particular, untimely repair of equipment, violation of technological instructions, introduction to the production technology of materials without taking into account their fire-hazardous properties, the formation of significant electrostatic charges. Fires are possible in case of violation of the rules of technical operation of electrical installations, for example, transitions in the network, as well as in conductors, violations, violations in the field of security.

In accordance with the Technical Regulations "General Fire Safety Requirements" (hereinafter referred to as Technical Regulations) approved by the Government of the Republic of Kazakhstan No. 14 dated January 14, 2009, buildings and structures are classified according to fire and explosive hazards in accordance with section 7 of Appendix 1 to the Technical regulations.

As for the explosion and fire hazards, the premises, regardless of their functional purpose, are divided into the following categories:

* A (increased risk of explosion / fire);
* B (danger of explosion / fire);
* B1-B4 (fire hazard);
* G (moderate fire hazard);
* D (fire risk reduction).

One of the most important tasks of fire prevention is the protection of building structures from destruction and to ensure their adequate strength at high temperatures in a fire. Building structures must be made of brick, concrete, glass, metal and other non-combustible materials. To prevent the spread of fire from one part of the building to another fire barriers in the form of fire walls, partitions and ceilings.

For fighting fires in the early stages of primary fire extinguishing equipment used in requires: manual and portable fire extinguishers and fire, etc.

In buildings, the fire hydrants are installed on staircases, doorways, site that is accessible and visible locations.

On the territory of the building there are the following fire extinguishing means:

* equipment for primary fire extinguishing (fire extinguishers, boxes with sand and shovels);
* technical means of fire protection (automatic detection and extinguishing installations, fire alarm systems);

4.6 Safety during working with equipment

Before you start, make sure of serviceability of wiring, switches, socket-outlets with which the equipment is included in the network, there is a computer grounding his health.

During the work with computer:

* Adjust the chair so that you can sit evenly but comfortably. Your back should rest slightly on the back of the chair.
* To avoid unnecessary strain on your shoulders, neck and waist, lift the seat of the chair so that your elbows are bent at an angle of 90 degrees, and your wrists are comfortably on the table top.
* Place the monitor and keyboard in front of you. When working with on the keyboard, position it so that the keyboard is directly in front of you. When working with numbers, position the keyboard so that the panel of numbers is in front of your working hand. Your body should be located at a distance of 20 cm from the keyboard.
* Your elbows should be bent and conveniently located on the armrests of the chair or on the tabletop.
* Position the computer mouse so that you can control it, keeping the elbow bent and lying on the arm of the chair or the table top. In this case, your wrist should be relaxed and forward. For convenience, you can put a special ergonomic pad under it.
* Place the items on your desktop so that you can reach the right things without extending your elbow. Things that you do not use, it is recommended to remove from the table.
* Straighten your legs and comfortably place them on a hard surface (floor or special support), but do not place them bent under the chair.
* Extend your hand in front of you: if you cannot reach the top edge of the screen with your fingertips, move it closer to you.
* The top of the screen should be located at the level of your eyes. If you wear glasses, then tilt the screen at about the same angle from which you usually read a book with glasses.
* Every hour, rise from your workplace for a few minutes and do a little exercise to relax and stretch.

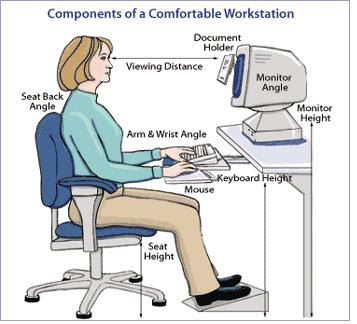


Figure 4.3 – Components of comfortable workstation

After the end of all means of computers and peripheral equipment must be shut down. You must remain only the necessary equipment in case of a continuous production process.

4.7 Calculations

4.7.1 Engineering calculations on noise

Sound is what we hear. Noise is unwanted sound. The difference between sound and noise depends upon the listener and the circumstances. Rock music can be pleasurable sound to one person and an annoying noise to another. In either case, it can be hazardous to a person's hearing if the sound is loud and if he or she is exposed long and often enough.

Sound is produced by vibrating objects and reaches the listener's ears as waves in the air or other media. When an object vibrates, it causes slight changes in air pressure. These air pressure changes travel as waves through the air and produce sound.

Table 4.3 - Approximate Speed of Sound in Common Materials

|  |  |  |
| --- | --- | --- |
| *Medium* | *Sound Velocity (ft/s)* | *m/s* |
| Air, dry (0°C and 760 mm Hg) | 1,100 | 330 |
| Wood (soft - along the fibre) | 11,100 | 3,400 |
| Water (15°C) | 4,700 | 1,400 |

Continuation of Table 4.3

|  |  |  |
| --- | --- | --- |
| *Medium* | *Sound Velocity (ft/s)* | *m/s* |
| Concrete | 10,200 | 3,100 |
| Steel | 16,000 | 5,000 |
| Lead | 3,700 | 1,200 |
| Glass | 18,500 | 5,500 |
| Hydrogen (0°C and 760 mm Hg) | 4,100 | 1,260 |

The hearing mechanism of the ear senses the sound waves and converts them into information which it relays to the brain. The brain interprets the information as sound. Even very loud sounds produce pressure fluctuations which are extremely small (1 in 10,000) compared to ambient air pressure (i.e., atmospheric pressure). The hearing mechanism in the ear is sensitive enough to detect even small pressure waves.

Noise - a collection of sounds that adversely affect the human body and hinder his work and leisure.

Noise is one of the most common occupational health hazards. In heavy industrial and manufacturing environments, as well as in farms, cafeterias, permanent hearing loss is the main health concern. Annoyance, stress and interference with speech communication are the main concerns in noisy offices, schools and computer rooms.

Noise can be continuous, variable, intermittent or impulsive depending on how it changes over time. Continuous noise is noise which remains constant and stable over a given time period. The noise of boilers in a power house is relatively constant and can therefore be classified as continuous.

Most manufacturing noise is variable or intermittent. Different operations or different noise sources cause the sound changes over time. Noise is intermittent if there is a mix of relatively quiet and noisy periods. Impulse or impact noise is a very short burst of loud noise which lasts for less than one second. Gun fire or the noise produced by punch presses are examples of such noise.

Decibel levels are important to you because they tell you how loud or quiet a sound is and this is very important as if something is too loud it can damage your hearing permanently. We usually measure how loud sound is through the use of a measure called the decibel, one decibel being one tenth of a bel, a very infrequently used measure. It is a measure of the sound pressure level or loudness.

The decibel scale is not a linear scale, it is a logarithmic scale. A doubling of your Decibel reading does not mean a doubling of the noise, for every 10dB increase in sound our perception of loudness doubles. So 60dB is twice as loud as 50dB and 70dB is four rimes as loud as 50dB.

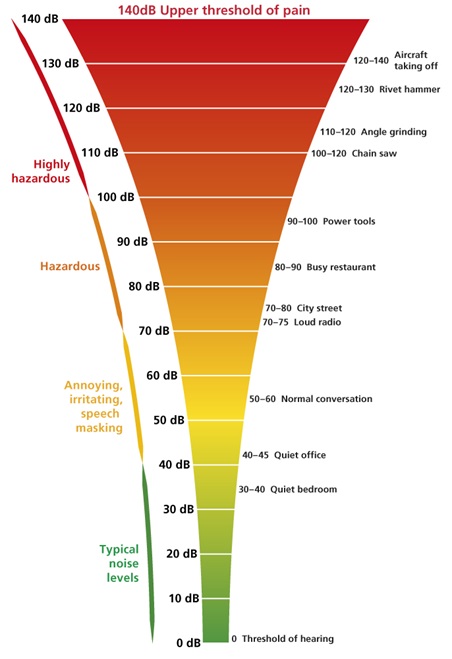


Figure 4.4 – Decibel levels

To prevent adverse outcomes of noise exposure, noise levels should be reduced to acceptable levels. The best method of noise reduction is to use engineering modifications to the noise source itself, or to the workplace environment. Where technology cannot adequately control the problem, personal hearing protection (such as ear muffs or plugs) can be used. Personal protection, however, should be considered as an interim measure while other means of reducing workplace noise are being explored and implemented.

As a first step in dealing with noise, workplaces need to identify areas or operations where excessive exposure to noise occurs.

The noise is perceived very subjectively. In this matter the specific situation, state of health, mood, environment. The main physiological effect of noise is that the damaged inner ear, to change the electrical conductivity of the skin, brain activity, heart and respiratory rate, total motor activity and change the size of some endocrine glands, blood pressure, vasoconstriction, expansion pupils of the eyes.

Working in conditions of prolonged noise exposure experienced irritability, headache, dizziness, memory loss, fatigue, loss of appetite, sleep disturbance. In a noisy background of deteriorating communication between people, as a result sometimes there is a feeling of loneliness and frustration, which can lead to accidents.

Prolonged exposure to noise levels exceeding the allowable value can cause human disease noise disease – sensorineural hearing loss. Based on all the above noise should be considered as a cause of hearing loss, certain nerve diseases, loss of productivity at work and sometimes loss of life.

One of the adverse factors of industrial environment on the PC is a high level of noise generated by the printing devices, air-conditioning equipment, fans, cooling themselves in the PC.

To calculate the noise level at the workplace from several non-coherent sources, the method of energy summation of emissions of individual sources is used.

|  |  |
| --- | --- |
|  | (4.1) |

Where,

Li is the sound pressure level of the i-th noise source;

n is the number of noise sources.

The obtained results of the calculation is compared with the permissible value of noise for a given workplace. If the calculation results above the permissible noise levels, the need for special measures to reduce noise. These include: lining the walls and ceiling of the hall sound-absorbing materials, noise reduction at source, proper layout of the equipment and the rational organization of the operator's station.

Sound pressure levels of noise sources acting on the operator in the workplace are presented in Table 4.4.

Table 4.4 – Noise source and level

|  |  |
| --- | --- |
| *Noise source* | *The noise level (dB)* |
| HDD | 40 |
| Fan | 45 |
| Monitor | 17 |
| Keyboard | 10 |
| Printer | 45 |
| Scanner | 42 |

Typically, the operator's station is equipped with the following equipment: a hard drive in the system unit, the fan (s) cooling the PC, monitor, keyboard, printer and scanner.

Substituting the values ​​of sound pressure level for each type of equipment in the formula, we get:

L = 10 · lg (104 + 104.5 + 101.7 + 101 + 104.5 + 104.2) = 49.5 dB

The resulting value does not exceed the permissible noise level for the operator's workplace, equal to 65 dB. And if we consider that hardly peripheral devices such as a scanner and a printer will be used at the same time, this figure will be even lower. Besides the immediate presence of optional operator at the printer, because the printer is equipped with a mechanism of auto sheets. Created conditions should ensure comfortable work. Compliance with the conditions that determine the optimal organization of the workplace of a software engineer will help to maintain good performance throughout the entire working day, and increase labor productivity in both quantitative and qualitative terms.

4.7.2 Engineering calculations on lighting

Light is a type of [energy](https://simple.wikipedia.org/wiki/Energy). It is a form of [electromagnetic radiation](https://simple.wikipedia.org/wiki/Electromagnetic_radiation) of a [wavelength](https://simple.wikipedia.org/wiki/Wavelength) which can be detected by the human [eye](https://simple.wikipedia.org/wiki/Eye).

Natural light is the light generated naturally. The most common source of natural light on Earth is the Sun. We receive natural light throughout our sunlight hours, whether we want it or not. That is, we cannot control the amount, duration and intensity of the natural light. The light we obtain from Sun covers the entire visible spectrum, with violet at one end and red at the other. This light is good for our health and is necessary for plants to carry out photosynthesis. Fire is another source of natural light.

Artificial light is generated by artificial sources, such as incandescent lamps, compact fluorescent lamps (CFLs), LEDs, etc. We can control the quality, quantity and duration of this light by controlling a number of factors. Artificial light is necessary for us to work during hours of low lighting (evening and/or night). The artificial light does not cover the entire light spectrum and is not too conducive to photosynthesis or health of life forms.

The premises where employees work on personal computers should have natural and artificial lighting.

At production sites with a permanent stay of people provides natural lighting. Changes in natural lighting at the level of light parts or caused by meteorological conditions should not cause a decrease in illumination in the working area below the values of the conditions of normative artificial lighting for relevant types of work. At the same time, the decrease in natural light is compensated by artificial lighting by automatically turning on lighting installations in work areas with insufficient lighting.

Artificial lighting is a system of general uniform lighting. According to paragraph 33 of the Sanitary and Epidemiological Requirements No. 1430, in the production and administrative-public premises at the workplace, the combined lighting systems are used.

Fluorescent lamps are used as light sources in artificial light. In lamps of local lighting it is allowed to use incandescent lamps, including energy-saving ones.

To ensure the normalized values of illumination in the premises for the use of personal computers is carried out timely replacement of blown lamps. Window panes and fixtures are cleaned at least twice a year. In the organization of artificial lighting provides working and emergency mode.

When performing work of medium accuracy, the combined illumination at the workplace should be at least 500 lux, low accuracy and rough work - at least 200 lux.

Illumination of working premises with displays is recommended in the range of 300–500 lux. In the field of view working with the display should not be windows and lighting. Luminaires should be with diffusers, the reflection on the screen from the light source is removed by the installation of protective screens. The brightness of the glow should not be less than the illumination of the working surface with documents, since jumps in brightness when changing fields of view (from document to screen and vice versa) should be minimal. Window openings in rooms with personal computers should be equipped with adjustable light-protective devices (blinds, curtains, external visors, etc.).

Required illumination: 300 lux. Premises dimensions are 4x3 m2; height is 3.5 m. LPO 12-2 × 40-904, fluorescent lamp 36 W in a lamp bulb 2, F = 2850 lm (PHILIPS production). Norma E = illuminance of 300 lux at 0.8 m from the floor. Safety factor K\_s= 0.8. Reflectance ceiling - 0.5, walls - 0.5, floor - 0.3. Define necessary number of fixtures to create a comfortable working lighting (formula 11.1):

|  |  |
| --- | --- |
| *N=(E⋅S)/(U⋅n⋅Ф⋅K\_s)* | (4.2) |

where

E - required illumination of horizontal plane, lux;

S - area of the premises, m2;

K\_s - safety factor;

U - utilization factor of lighting system;

F - one lamp luminous flux, lm;

n - number of lamps in one fixture.

Define area of the premises, m2

S\_p=4⋅3=12

Define premises index (formula 11.2):

|  |  |
| --- | --- |
| *φ=S/((h-K\_s)⋅P)* | (4.3) |

where

S - area of the premises, m2;

h - height of the work surface to the light fixture, m;

P - perimeter of the premises, m

Premises index is:

φ=12⁄(((3.5-0.8)⋅(4+3)))=0.64

Determine utilization factor on the basis of values of the reflection coefficients and premises index:

U=0.51

Calculate required number of fixtures:

N=(300⋅12)/(0.51⋅2⋅2850⋅0.8)=1.55

For premises, 7 lighting fixtures are required.

Based on calculations made on artificial lighting shown that artificial lighting meet the necessary requirements / standards.

4.8 Anthropogenic impact of the object on the environment and environmental safety measures

One of the most important problems of the 21st century is the problem of protecting the environment from the increasing anthropogenic impact. Due to the development of technology in our daily life, a huge number of devices, devices, devices have emerged that radically changed the microenvironment affecting us. In everyday life, we increasingly began to pay attention to electromagnetic fields, noise, various radiations, as well as air, water and soil pollution with various harmful substances.

The main and most common type of negative human impact on the biosphere is pollution. Pollution refers to the entry into the surrounding environment of any solid, liquid and gaseous substances, microorganisms or energies (in the form of sounds, noises, radiations) in quantities harmful to human health, animals, plants and ecosystems.

Pollution of surface groundwater, pollution of atmospheric air, soil contamination, etc., are distinguished for pollution objects. By the way, the surfaces of the surfaces are separated from the submerged submersible water vapor, the atmospheric airflow, the exposure to the surface, etc.

A qualitative leap in the development of science and technology over the past two centuries, and especially nowadays, has led to the fact that human activity has become a factor of the planetary scale, guiding force in the further evolution of the biosphere. Now mankind uses for its needs an increasing part of the planet's territory and increasingly large amounts of mineral resources. Over time, the anthropogenic impact has become global. Anthropogenes replaced virgin landscapes. Territories that are not affected by human beings are practically nonexistent. There, where the human foot has not set foot, the products of its activity come with streams of air, river and groundwater.

Anthropogenic impact - any kind of human activity in its relation to nature, man-made - purposeful process of technical (including geological) human activity in the biosphere and near-Earth space.

Negative impact on leaving the environment: unwanted papers, idle computers or old items that are no longer in use should be given to recycling waste in order to safely destroy them or ensure the reuse of raw materials, energy, products and materials in the national economy.

In developing such activities, the following principles should be considered:

* measures should be sufficiently effective and feasible;
* measures must take into account the specifics of a particular enterprise;
* implementation of the developed measures, if possible, should not be accompanied by a decrease in labor productivity.

The company implemented the following measures: city Saturday work, recycling of used paper, recycling of old equipment, energy-saving system, the use of environmentally friendly transport.