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та навчальні завдання з розвитку англомовного професійного спілкування до практичних занять і самостійної роботи для здобувачів вищої освіти першого (бакалаврського) рівня за освітньо-професійною програмою «Агроінженерія» спеціальності 208 «Агроінженерія» галузі знань 20 «Аграрні науки та продовольство» усіх форм навчання

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ПЕРЕДМОВА

Методичні вказівки та навчальні завдання призначені для розвитку англомовної професійної лексичної компетентності та комунікативних навичок здобувачів освітнього рівня «Бакалавр», необхідних для здійснення ефективної професійної комунікації в галузі агроінженерії.

Дана методична розробка містить інформацію щодо експлуатації та класифікації машин; огляд типової системи з технічного обслуговування та ремонту обладнання; основні правила технічної експлуатації машин та нагляд за їх виконанням; проектування сільськогосподарських машин та аналіз вирішення особливих завдань під час проектування сільськогосподарських машин. Методичні вказівки та навчальні задання мають на меті допомогти оволодіти базовою професійною лексикою, дати можливість використовувати різні мовленнєві зразки, які можуть зустрічатися в цій галузі.

Методичні вказівки та навчальні завдання призначені для студентів, які обізнані зі структурними закономірностями англійської мови і продовжуватимуть опановувати основи професійного дискурсу. Текстовий матеріал може бути використаний для вирішення декількох завдань у процесі навчання: для ознайомлювального та пошукового видів читання, розвитку навичок перекладу, реферування і анотування, роботи зі словником, а також комунікативних навичок.

Тексти для читання дають можливість практичного застосування термінів. Післятекстові запитання дозволяють активізувати використання в комунікативній ситуації ці словникові одиниці, а також мовленнєві зразки, які студенти розглядали під час читання. Кожен урок містить вправи для повторення, які перевіряють рівень засвоєння словникового запасу, що дає можливість обговорювати інформацію, пов’язану з галуззю агроінженерії.

Пропонуючи цю розробку, ми сподіваємося, що інтерес студентів до представленої інформації про галузь машинобудування підвищить їх здатність спілкуватися англійською мовою.

UNIT 1. Operation of Machines. Standard System for Maintenance and Repair of Equipment.

1.1. Operation of Machines.

VOCABULARY

Task 1. Match each word with the proper definition.

1. Lubrication	**a.** The process of minimizing friction between machine parts to reduce damage and ensure smooth operation.
2. Efficiency	**b.** The maximum amount of weight or stress a machine can handle without failure.
3. Preventive maintenance	**c.** Regularly scheduled servicing of equipment to prevent breakdowns or failures.
4. Wear and tear	**d.** The ability of a machine to perform its function with minimal waste of energy or resources.
5. Calibration	**e.** Gradual deterioration of machine components due to regular use over time.
6. Load capacity	**f.** The adjustment of a machine to ensure accurate measurements or optimal performance.
7. Diagnostics	**g.** The identification and analysis of issues or malfunctions in machinery.
8. Torque	**h.** The resistance between two surfaces in contact that can cause energy loss during machine operation.
9. Friction	**i.** The rotational force generated by a machine component, usually measured in Newton-meters.
10. Power transmission	**j.** The process of transferring mechanical energy from one machine part to another, often using belts, chains, or gears.

WRITING

Task 2. Complete the sentences using the correct vocabulary word from the list.

Torque, Friction, Power Transmission, Lubrication, Efficiency, Preventive Maintenance, Wear and Tear, Calibration, Load Capacity, Diagnostics.

1. Regular _____ of machinery can significantly reduce friction and prevent component damage.

2. The _____ of a machine determines how much weight or stress it can safely handle during operation.

3. _____ is essential for ensuring the precise operation of equipment, especially in measuring instruments.

4. Excessive _____ between moving parts can lead to overheating and reduced efficiency.

5. _____ ensures that energy is effectively transferred between components, such as from a motor to a conveyor belt.

6. Over time, all machines experience _____, which can affect their performance and require repairs.

7. Mechanics perform _____ to identify and resolve potential problems in machinery before they become serious.

8. Properly applied _____ can increase the lifespan of machine parts by reducing wear.

9. The _____ of an engine or motor is measured in terms of its ability to produce rotational force.

10. Following a schedule of _____ can help prevent costly breakdowns and extend the machine's lifespan.

READING

Task 3. Read the text and answer the questions.

OPERATION OF MACHINES

The operation of machines (metalworking, woodworking, forging, pressing, and foundry equipment) encompasses measures for storage, transportation, installation, setup, calibration, maintenance, and servicing to ensure geometric and technological accuracy. Below is a summary of essential rules, with further details provided in the manual.

Transportation must follow the operation manual. Machines should be moved on a metal sheet or specialized trolley with dampers to prevent damage from vibrations. Heavy equipment should be placed near lifting mechanisms for easier assembly and repairs.

Installation varies by machine type. Light-to-medium weight machines are leveled and secured with foundation bolts on a concrete

floor. High-precision or heavy machinery, as well as machines under high dynamic loads, require vibration-dampening supports or individual foundations.

After assembly, machines are grounded, connected to utilities (e.g., coolant, lubrication, compressed air), and tested for operational readiness.

Setup and Adjustment involve preparing the machine for operation, aligning tools and workpieces, and ensuring auxiliary devices function correctly. Adjustments address changes in operating conditions or restore degraded parameters. Universal machine tools are adjusted by the operator, while specialized machines are preset according to setup charts.

Accuracy Checks ensure compliance with standards. Geometric accuracy is verified for base surfaces, tool alignment, and movement precision, while technological accuracy is assessed by processing test workpieces and analyzing dimensional tolerances.

Maintenance includes regular cleaning, lubrication, inspection, and minor repairs. Operators manage routine adjustments, workpiece handling, and production quality. Hydraulic systems require temperature checks, fluid replacement, and leak inspections, while electrical systems need cleaning, screw-tightening, and contact maintenance.

Adherence to the machine's operation manual ensures its longevity and reliable performance.

1. What aspects are included in the operation of machines as described in the text?

2. Why is it important to use dampers during machine transportation?

3. What are the requirements for installing light-to-medium weight machines compared to heavy or high-precision equipment?

4. What tasks are involved in the setup and adjustment of a machine before operation?

5. How are accuracy checks conducted, and what types of accuracy are verified?

6. What is the role of the operator in maintaining automated equipment?

7. What routine maintenance tasks are necessary for hydraulic systems?

8. Why is it crucial to follow the operation manual for each machine?

Task 4. Read the statements and decide if they are true (T) or false (F).

1. The operation of machines includes measures for transportation, installation, and maintenance.

2. Heavy equipment can be moved across the workshop without using winches or dampers.

3. High-precision machinery should be installed directly on the workshop floor without special foundations.

4. Machine setup involves preparing the machine for use and adjusting kinematic chains, tools, and workpieces.

5. Geometric accuracy is checked according to industry standards, including checks for tool and workpiece positioning.

6. Technological accuracy is primarily checked after a machine has been used for a while.

7. Routine maintenance for automated equipment is only the responsibility of the technician, not the operator.

8. Electrical equipment maintenance includes cleaning components and checking contact surfaces for damage.

SPEAKING

Task 5. Answer the questions in full sentences.

1. What is included in the operation of machines in mechanical engineering?

2. How should heavy equipment be transported within a workshop?

3. Where should high-precision machines be installed, and why?

4. What does machine setup involve?

5. How is geometric accuracy of machines verified, and what does it include?

Task 6. Choose the correct answer for each question.

1. What is included in the operation of machines in mechanical engineering?

a) Only transportation and assembly

b) Storage, transportation, installation, setup, calibration, and maintenance

c) Only setup and maintenance

d) Only cleaning and lubrication

2. How should heavy equipment be moved within a workshop?

a) It should be carried manually

b) Using a specialized trolley with winches and dampers

c) Using forklifts

d) On a conveyor belt

3. Where are high-precision machines typically installed?

a) On general concrete floors with no special foundation

b) On individual foundations or vibration-absorbing supports

c) On wooden platforms

d) On mobile trolleys

4. What does machine setup refer to?

a) The preparation of a machine for its first use only

b) The process of making the machine ready for its intended use, including adjustments

c) Only the installation of machinery

d) The cleaning of machinery before operation

5. How is the geometric accuracy of machines verified?

a) By visual inspection only

b) Through trial processing

c) By following state standards that define the testing schemes and allowable deviations

d) By measuring only the machine's weight

SPEAKING

Task 7. Prepare a short presentation (2-3 minutes) on one of the following topics. Use simple language and try to include examples to illustrate your points. After your presentation, be ready to answer a few questions from your groupmates or teacher.

Topics:

1. **The Importance of Machine Maintenance in Mechanical Engineering**

– Discuss the different types of machine maintenance, such as preventive maintenance, lubrication, and adjustments. Provide examples of how regular maintenance can increase the lifespan of machines and improve efficiency.

2. **How to Properly Transport and Install Heavy Machinery**

– Explain the proper procedures for transporting and installing large machines in a workshop. Discuss the use of specialized equipment, such as trolleys, winches, and foundation bolts, and give examples of how improper installation can affect machine performance.

3. **The Role of Calibration and Adjustment in Machine Accuracy**

– Define calibration and adjustment, and explain their importance in maintaining machine precision. Include examples of common adjustments made to machines and how they contribute to the overall quality of production.

4. **The Impact of Vibration Control on Heavy Machinery**

– Discuss why vibration control is important in maintaining high-precision and heavy machinery. Provide examples of vibration-absorbing techniques used, such as using individual foundations or special supports.

5. **The Process of Machine Setup and How It Affects Production Quality**

– Explain what machine setup involves, including adjusting kinematic chains, tools, and workpieces. Provide examples of how proper setup can improve the quality and efficiency of production processes.

WRITING

Task 8. Write a short paragraph (4-5 sentences) about the importance of machine maintenance in mechanical engineering. Use the following words.

Maintenance, efficiency, lifespan, lubrication, adjustments.

1.2. Standard System for Maintenance and Repair of Equipment

VOCABULARY

Task 1. Match the words with their definitions.

1. Maintenance	**a.** The activities aimed at restoring equipment functionality after a breakdown.
2. Repair	**b.** The total time a machine or equipment is used in operation.
3. Planned maintenance	**c.** The evaluation process to determine whether equipment should be updated or retired.
4. Technological preparation	**d.** Scheduled tasks designed to maintain the operational performance and accuracy of equipment.
5.Diagnostic measures	**e.** The amount of material resources required for maintenance or repairs.
6. Operational time	**f.** Ensuring that workers are adequately trained for the maintenance and repair tasks.
7. Repair cycle	**g.** The time intervals at which maintenance tasks or repairs are planned to be performed.
8. Material intensity	**h.** The preparation of technical resources and tools necessary for maintenance and repair.
9. Workforce training	**i.** Actions taken to restore the machine's operational capacity and prevent future breakdowns.
10. Equipment modernization	**j.** The steps taken to check the condition of equipment and diagnose potential issues before major repairs.

WRITING

Task 2. Complete the sentences using the correct vocabulary word from the list.

Maintenance, Repair, Technological Preparation, Diagnostic Measures, Operational Time, Planned Maintenance, Repair Cycle, Workforce Training, Material Intensity, Equipment Modernization.

1. Regular _____ is essential to ensure the longevity and proper functioning of machinery.

2. The factory invests in _____ to enhance equipment

performance and reduce the risk of breakdowns.

3. _____ refers to the time a machine spends in active use during production.

4. During a breakdown, the technician will conduct _____ to identify the problem and determine the necessary fix.

5. _____ involves training employees to perform maintenance and repairs efficiently and safely.

6. The company conducts _____ every six months to keep equipment in optimal condition.

7. _____ is a set of activities designed to restore equipment functionality after a fault or breakdown.

8. After each _____, machines are checked and restored to ensure they continue functioning without major issues.

9. _____ ensures that the necessary tools and materials are prepared in advance for maintenance tasks.

10. _____ helps businesses to update their machines with the latest technology to improve efficiency.

READING

Task 3. Read the text and answer the questions.

TYPICAL SYSTEM OF EQUIPMENT MAINTENANCE AND REPAIR

The typical system of equipment maintenance and repair refers to a set of interdependent provisions and standards, adherence to which ensures the preservation of the equipment's productivity, accuracy, and other parameters within certain permissible conditions during the established service life, as guaranteed in the technical documentation provided by the manufacturers.

The system of works regulated by the typical system includes: maintenance operations to keep machines operational during their storage, transportation, preparation for use, and utilization, including oversight of compliance with technical operating rules during storage, transportation, and operation; repairs aimed at maintaining and restoring the functionality and reliability of the equipment.

The typical system is developed based on the fundamental idea that effective machine operation is impossible without timely technical maintenance and repair, performed in necessary volumes

and established quality standards. The recommendations and standards of the typical system take into account the repair characteristics of each piece of equipment subject to maintenance and repair, its intensity of use in the production process, and the objective degree of machine wear.

Specifically, the typical system of maintenance regulates the following: a list of mandatory planned maintenance operations; the frequency of these operations based on the operational time; the distribution of tasks among performers; labor intensity and cost of each planned operation; labor intensity and cost of unplanned maintenance; organization of maintenance execution and quality control; technological and material preparation for maintenance; staff training, work classification, and forms of payment for maintenance workers; organization of planning, accounting, execution, and analysis of maintenance results; supervision of compliance with machine operation rules.

The typical system of equipment repair establishes the following: types of planned repairs and their scheduling; planned duration of repair cycles; frequency of intra-cycle repairs based on operational time, as well as technical diagnostics measures to refine machine overhaul schedules; labor intensity, material consumption, and cost of planned repairs; labor intensity, material consumption, and cost of unplanned repairs (failure rectification); measures for technological and material preparation for repairs, staff training, and payment forms for repair workers; work classification depending on the repair specifics of the equipment; organization of machine repair initiation; organization of machine reception from repair and quality control; organization of planning, accounting, execution, and analysis of repair results.

The typical system also includes organizing periodic analysis of the feasibility of equipment use, modernization, or decommissioning. Proper use of such analysis results allows for constant improvement of the quality of the company’s equipment fleet, which, together with regulated maintenance, repair improvements, and optimization of overhaul schedules, significantly reduces repair and maintenance costs, as well as production downtime related to equipment failures.

All provisions of the typical system, except for those specifically

highlighted, are interdependent, and the failure to implement even one of them significantly reduces or sometimes nullifies the effectiveness of other provisions.

1. What is the purpose of the typical system of equipment maintenance and repair?

2. What are the key components included in the typical maintenance and repair system?

3. How does the typical system ensure the preservation of a machine's productivity and accuracy?

4. What factors are considered when developing the typical system for maintenance and repair?

5. What does the typical system regulate in terms of planned maintenance operations?

6. How is the labor intensity and cost of maintenance operations determined in the typical system?

7. What is the role of staff training in the typical system of equipment maintenance and repair?

8. How does the typical system help reduce repair and maintenance costs in a company?

Task 4. Read the statements and decide if they are true (T) or false (F).

1. The typical system of maintenance and repair ensures the preservation of machines' productivity and accuracy only under ideal conditions.

2. The typical system includes regulations for the transportation and storage of equipment but not for its installation and operation.

3. The system is developed based on the principle that effective machine operation requires timely maintenance and repairs.

4. The typical system does not consider the intensity of machine usage when planning maintenance operations.

5. The typical system includes a set of mandatory planned maintenance operations, with clear periodicity and task allocation.

6. The typical system focuses only on the labor costs of maintenance, ignoring material costs.

7. The system provides for periodic analysis to determine whether equipment should be used, modernized, or decommissioned.

8. Ignoring any provision of the typical system can significantly reduce or eliminate its effectiveness.

SPEAKING

Task 5. Answer the questions in full sentences.

1. What is the primary purpose of a typical system of equipment maintenance and repair?

2. Why is it important to follow the established regulations and norms for maintenance and repair in machines?

3. What does the system of planned maintenance include?

4. How does workforce training contribute to the effectiveness of equipment maintenance?

5. What is the role of diagnostic measures in the maintenance and repair process?

Task 6. Choose the correct answer for each question.

1. What is the primary purpose of a typical system of equipment maintenance and repair?

a) To improve machine design

b) To ensure the machines operate efficiently and meet productivity, accuracy, and other performance standards

c) To increase the cost of maintenance

d) To reduce the number of machines in use

2. What is included in the system of planned maintenance?

a) Only emergency repairs

b) The preparation of equipment for use, its transportation, and storage

c) The operations needed to maintain machines during storage and use

d) The destruction of old machines

3. What is the main objective of machine repairs in the typical system?

a) To extend the machine's service life and restore its working condition

b) To modify the machine's original design

c) To replace machines with newer models

d) To increase the number of operators for each machine

4. How does workforce training affect equipment maintenance?

a) It reduces the amount of repair work required

b) It ensures the workers can effectively perform maintenance and repairs on machines

c) It makes the equipment more complex to operate

d) It increases the cost of machine repairs

5. Why are diagnostic measures important in the maintenance system?

a) To identify and address potential issues before they lead to machine failure

b) To make the repair process more expensive

c) To reduce the overall productivity of the machines

d) To avoid the need for scheduled maintenance

SPEAKING

Task 7. Prepare a short presentation (2-3 minutes) on one of the following topics. Use simple language and try to include examples to illustrate your points. After your presentation, be ready to answer a few questions from your groupmates or teacher.

Topics:

1. **The Importance of Regular Equipment Maintenance in Industrial Settings**

– Discuss the benefits of regular maintenance, how it improves machine longevity, reduces downtime, and ensures safety. Include examples from manufacturing industries where proper maintenance is critical.

2. **Common Types of Equipment Failures and How to Prevent Them**

– Talk about the common issues machines face, such as wear and tear, overheating, and misalignment, and provide tips for preventing these problems through proper maintenance and care.

3. **How Technology is Changing Equipment Maintenance**

– Explain how modern technology, like predictive maintenance software and IoT sensors, is improving how equipment is monitored and maintained in real-time. Give examples of how these technologies are used in different industries.

4. **The Role of Operators in Equipment Maintenance and Repair**

– Describe the responsibilities of operators in maintaining equipment, including regular checks, reporting problems, and performing minor repairs. Highlight the importance of training and awareness for operators.

5. **The Benefits of Preventive vs. Reactive Maintenance**

– Compare and contrast preventive maintenance (regularly scheduled tasks) with reactive maintenance (repairing after failure). Discuss the cost-effectiveness and efficiency of adopting a preventive maintenance system in industrial operations.

WRITING

Task 8. Write a short paragraph (4-5 sentences) on the importance of regular equipment maintenance in industrial settings. Use the following words.

Maintenance, efficiency, downtime, reliability, productivity.

UNIT 2. Classifications of Machines.

VOCABULARY

Task 1. Match each term with its correct definition.

1. Automation	**a.** A machine capable of performing a complete work cycle with minimal human intervention but requires setup and minor adjustments by an operator.
2. Precision	**b.** A system of interconnected machines working in sequence to process parts automatically.
3. Metal-cutting machine	**c.** The degree of accuracy or exactness of a machine's operation or output.
4. Transportable equipment	**d.** Equipment designed to execute specific tasks for a narrow range of operations or materials.
5. Automatic line	**e.** Machines designed for general-purpose operations, adaptable to various tasks.
6. Semi-automatic machine	**f.** Equipment controlled by prewritten instructions that can be modified as needed.

7. Specialized equipment	**g.** Machinery used for cutting and shaping metal, such as lathes or drills.
8. Universal machine	**h.** Equipment categorized by its weight, typically above 100 tons.
9. Heavy equipment	**i.** Equipment light enough (up to 5 tons) to be moved for repairs or relocation.
10. Program-controlled machine	**j.** The use of technology to perform tasks without human intervention.

WRITING

Task 2. Match each sentence with the correct vocabulary word from the list.

Automation, Precision, Metal-cutting machine, Transportable equipment, Automatic line, Semi-automatic machine, Specialized equipment, Universal machine, Heavy equipment, Program-controlled machine.

1. A lathe is an example of a _____ used in manufacturing to shape metal parts.

2. Modern factories rely heavily on _____ to reduce the need for manual labor and increase efficiency.

3. _____, such as bulldozers and cranes, are often used in construction due to their massive size and capacity.

4. Equipment like milling machines and drills are designed to achieve high levels of _____ during operation.

5. A CNC lathe is a _____ that uses prewritten instructions to execute tasks with minimal operator input.

6. Factories often use a _____ to produce identical parts in a continuous, automated sequence.

7. _____ is designed to perform a limited number of specific tasks, such as creating parts for engines.

8. A drill press is considered a _____ because it can perform various general-purpose operations.

9. _____ , weighing less than 5 tons, can be transported to repair shops for maintenance.

10. A _____ requires an operator to load parts and start the process but completes its cycle automatically.

READING

Task 3. Read the text and answer the questions according to the text.

CLASSIFICATION OF MACHINES

All equipment in mechanical engineering production is classified by technological purpose into four types: metal-cutting machines, forging and pressing equipment, woodworking equipment, and casting equipment.

Each type is further divided into groups based on technological purpose. For instance, the main groups of "metal-cutting machines" include lathes, drilling machines, milling machines, grinding machines, and others. Forging and pressing equipment is divided into hammers, presses, shears, etc. Within these groups, machines are classified by type and size according to their structural design (e.g., lathes are divided into screw-cutting lathes, turret lathes, vertical lathes, etc.).

The composition of groups for forging, pressing, and casting equipment is provided in the structural repair cycle tables of the Typical System, while the composition of groups and types for all equipment is detailed in tables containing empirical formulas for determining repair complexity. These tables consider the structural features of machines in each group and type.

Weight is a critical parameter influencing repair labor intensity and material consumption. Machines are classified into categories based on weight:

– Light: up to 1 ton
– Medium: up to 10 tons
– Large: up to 30 tons
– Heavy: up to 100 tons
– Unique: over 100 tons

Additionally, equipment weighing up to 5 tons is considered transportable, while equipment over 5 tons is non-transportable. This distinction is crucial for organizing specialized repairs. Transportable machines can be sent to a specialized repair plant, while non-transportable equipment requires on-site repair by mobile teams.

Automation Level Classification: Machines are classified into:

1. Manually operated: Each operational or idle movement

requires a worker's command.

2. Semi-automatic: Machines perform the entire work cycle automatically but require setup, workpiece installation/removal, and cycle start by an operator.

3. Automatic: These machines handle all operations, including workpiece installation, removal, and cycle execution, needing only initial setup.

4. Numerically controlled (NC/CNC): Semi-automatic or automatic machines controlled by prewritten, easily replaceable programs.

Semi-automatic machines can be upgraded to automatic machines using automation tools, specialized devices, industrial robots, or program-controlled manipulators. These enhancements automate workpiece installation/removal and cycle execution commands. Automatics are often combined into automatic production lines, complexes of machines with shared transport, power, and automation systems.

Automatic lines are classified into:

– Single-section (rigidly connected): No intermediate buffers between machines.

– Multi-section (flexibly connected): Machines are separated by buffers.

Precision Classes: Equipment is divided into five precision classes:

– Normal precision (Class N)

– Increased precision (Class P)

– High precision (Class V)

– Very high precision (Class A)

– Ultra-precision (Class S)

Most forging, pressing, woodworking, and casting equipment falls under Class N, with a small portion in Class P. Similarly, most metal-cutting machines are Class N, while Classes P, V, A, and S are collectively termed precision equipment.

Specialization Levels: Metal-cutting machines are classified into five subtypes based on specialization:

– Universal machines: Perform a wide range of mechanical operations (e.g., screw-cutting lathes, radial drilling machines).

– General-purpose machines: Perform a limited range of operations on a broad range of parts (e.g., form-cutting machines, multi-tool lathes).

– Specialized machines: Produce parts of one type in various sizes (e.g., crankshafts, couplings).

– Special equipment: Processes parts of specific types and sizes.

– Modular machines: Specialized machines made of standardized, normalized, and unified parts.

This classification is crucial for effective repair and maintenance planning, as the level of specialization determines machine complexity and repair labor intensity. The rational organization of automated production prioritizes special and modular machines, which reduce labor costs for maintaining automatic lines compared to those based on universal equipment.

1. What are the four main types of equipment in mechanical engineering production classified by their technological purpose?

2. How are machines within each type further classified based on structural design?

3. What is the significance of machine weight in the context of repair and maintenance?

4. How are machines categorized based on automation levels, and what distinguishes each category?

5. What are the differences between single-section and multi-section automatic lines?

6. What precision classes are used to classify equipment, and which types of machines are considered precision equipment?

7. How are metal-cutting machines classified according to their level of specialization, and what defines each subtype?

8. Why is the classification of machines important for repair and maintenance planning, particularly in automated production?

Task 4. Read the statements and decide if they are true (T) or false (F).

1. Metal-cutting machines are classified into groups such as turning, drilling, milling, and grinding.

2. Only transportable equipment can be used for specialized repair in factories.

3. Semi-automatic machines require an operator to start the cycle but perform the process automatically.

4. The accuracy of equipment is categorized into five classes, including high precision and normal precision.

5. Universal machines are designed for a specific task and cannot perform multiple operations.

6. Heavy equipment refers to machines that weigh more than 5 tons and are considered non-transportable.

7. Automation is used to reduce manual labor and improve efficiency in manufacturing processes.

8. Automatic lines are classified into single-section and multi-section lines, depending on the presence of intermediate buffers.

SPEAKING

Task 5. Answer the questions in full sentences.

1. What are the four main types of equipment in machine-building production?

2. How are machines classified according to their weight, and why is this classification important?

3. What is the difference between semi-automatic machines and fully automatic machines?

4. How does the degree of specialization influence the complexity of machine maintenance and repair?

5. What types of precision classes exist for equipment, and which class do most metal-cutting machines belong to?

Task 6. Choose the correct answer for each question.

1. What are the four main types of equipment in machine-building production?

a) Metal-cutting machines, woodworking equipment, casting equipment, and packaging equipment

b) Metal-cutting machines, forging-press equipment, woodworking equipment, and casting equipment

c) Welding machines, grinding machines, turning machines, and metal cutters

d) Milling machines, lathe machines, grinding equipment, and forging equipment

2. What is the classification of machines based on their weight used for?

a) To determine their speed

b) To estimate their energy consumption

c) To assess the complexity of repairs and maintenance

d) To decide the color of the machine

3. Which type of equipment requires only initial setup and does not require further intervention during the working cycle?

a) Manual machines

b) Semi-automatic machines

c) Fully automatic machines

d) Machines with CNC control

4. What does a flexible connection in an automatic line mean?

a) Machines work independently without connection

b) Machines are linked through accumulators

c) Machines are grouped based on function

d) Machines are connected through manual labor

5. What is the main characteristic of precision-class machines like the "A" or "C" classes?

a) They are less expensive than other machines

b) They have higher speed

c) They are used for highly accurate operations

d) They are designed for heavy-duty tasks

SPEAKING

Task 7. Prepare a short presentation (2-3 minutes) on one of the following topics. Use simple language and try to include examples to illustrate your points. After your presentation, be ready to answer a few questions from your groupmates or teacher.

Topics:

1. **The Role of Metal-Cutting Machines in Modern Manufacturing**

– Explain the importance of metal-cutting machines in various industries.

– Provide examples of common types of metal-cutting machines (e.g., lathes, mills).

– Discuss how these machines help improve efficiency and precision.

2. **Types of Automation in Manufacturing Equipment**

– Describe the different levels of automation (manual, semi-automatic, and automatic).

– Explain how automation reduces the need for human intervention.

– Provide examples of automated machines in modern factories.

3. **How Weight Affects the Repair and Maintenance of Machinery**

– Discuss the classification of machines based on their weight (light, medium, heavy).

– Explain how weight influences the repair process and transportation.

– Provide examples of light vs. heavy machines and how they are maintained.

4. **The Evolution of CNC Machines and Their Impact on Industry**

– Describe what CNC (Computer Numerical Control) machines are and how they work.

– Explain how CNC technology has revolutionized manufacturing processes.

– Provide examples of industries that benefit from CNC machines (e.g., automotive, aerospace).

5. **The Importance of Precision in Manufacturing Equipment**

– Explain the concept of precision in machinery and its different classes (normal, high, and precision).

– Discuss why precision is crucial for producing high-quality products.

– Give examples of industries where precision machines are essential (e.g., electronics, medical devices).

WRITING

Task 8. Write a short paragraph (4-5 sentences) about the classification of machines in manufacturing. Use the following words.

Equipment, automation, precision, categories, repair.

UNIT 3. Main rules of technical operation of machines and supervision of their implementation.

3.1. Arrangement of premises for storing and using machines

VOCABULARY

Task 1. Match each term with its correct definition.

1. Ventilation	**a.** The degree of exactness or accuracy required in a machine's performance.
2. Humidity	**b.** A system to supply and circulate air to maintain air quality and temperature.
3. Temperature	**c.** The process of piecing together different parts of a machine or system.
4. Precision	**d.** The ability of a space or mechanism to handle a specific weight or mass.
5. Insulation	**e.** The level of moisture present in the air of a given environment.
6. Lighting	**f.** A protective barrier to prevent heat loss or electrical hazards.
7. Equipment	**g.** A safe electrical connection to the earth to protect machines and operators.
8. Assembly	**h.** The tools or machines used for a specific purpose in production.
9. Grounding	**i.** The control of heat levels in a room to meet operational requirements.
10. Load capacity	**j.** The provision of sufficient and appropriate light for working conditions.

WRITING

Task 2. Complete the sentences using the correct vocabulary word from the list: ventilation, humidity, temperature, precision, insulation, lighting, equipment, assembly, grounding, load capacity

1. Proper _____ ensures that the air quality in a room meets the standards for storing sensitive machines.

2. Maintaining the correct _____ is crucial to avoid damage caused by excess moisture in the air.

3. Machines that operate at high levels of _____ require controlled environments to maintain their accuracy.

4. The _____ of the premises should be sufficient to protect against heat loss and prevent electrical hazards.

5. Adequate _____ is necessary to provide a safe and efficient working environment for operators.

6. Heavy-duty _____ is required to handle the weight of large industrial machines.

7. The _____ process of machines must be conducted carefully to ensure they function properly.

8. Ensuring proper _____ of electrical systems reduces the risk of accidents or equipment malfunctions.

9. The allowable _____ of lifting mechanisms must match the weight of the materials being handled.

10. Sensitive _____ like CNC machines should be installed in rooms with stable temperature and humidity.

READING

Task 3. Read the text and answer the questions according to the text.

ARRANGEMENT OF PREMISES FOR STORING AND USING MACHINES

The long-term preservation of the initial technical parameters of metal-cutting machines and forging-press equipment is possible only when they are installed in closed heated rooms that ensure:

– protection from atmospheric precipitation;

– protection from external sources of air dust and aggressive gases (only traces of gaseous acids and alkalis are allowed);

– maintaining the allowable air temperature within a range depending on the required processing accuracy;

– maintaining the allowable air humidity within a range depending on the actual temperature.

Machines of accuracy classes N and P can be installed in general factory premises. However, if a machine emits abrasive or metal dust intensively (using abrasive tools or processing cast iron), it must be equipped with exhaust devices to protect the air from contamination.

However, it is preferable to install machines using abrasive tools

separately from those using metal tools. To maintain air cleanliness, the premises should be equipped with supply-exhaust ventilation with dust-cleaning filters.

Equipment of classes B, A, and C must be installed only in isolated rooms. It is unacceptable to install machines of different types of these classes together, even if they are close in technological purpose or material of the tool (for example, gear and thread grinding machines).

Supply ventilation systems in rooms with machines of classes B, A, and C should be equipped with air heating devices.

The normal air temperature in production premises of machine-building enterprises is considered to be 20°C. Depending on the accuracy class of the equipment installed, the following deviations from the nominal temperature are allowed:

Accuracy class of machines	N	P	B	A	C
Allowable temperature variations, °C	±10	±5	±2	±1	±0.5

Accordingly, the allowable humidity variations in the premises with equipment, based on the actual air temperature, are as follows:

40–75 % at temperatures below 24°C;

40–60 % at temperatures below 28°C;

40–55 % at temperatures above 28°C;

In winter, the acceptable temperature range in premises with machines of classes N and P can be maintained using centralized heating systems of any type, and in summer – by using supply-exhaust ventilation.

The best type of heating system for rooms with equipment of classes B, A, and C is air heating. Water heating is also acceptable, but the radiators must be placed no closer than 1 meter from the machines and must be covered with thermal insulation screens.

In rooms for equipment of class B, the temperature can be regulated using valves in the heating system. Workshops with machines of classes A and C must be equipped with automatically operating air conditioning units.

General lighting in the premises should be provided by suspended

daylight lamps, and combined with local lighting from networks with a voltage no higher than 36V, in accordance with the rules and standards for artificial lighting of industrial enterprises.

Premises for machine installation must be equipped with lifting and transport mechanisms with electric drives, in sufficient numbers to ensure the uninterrupted operation of all main equipment. The lifting capacity of these mechanisms must correspond to the maximum weight of the workpiece allowed for processing on the equipment they are intended to service. It is also desirable to have a bridge crane in the workshop for disassembling machines into components during repairs conducted at the place of operation. It is not recommended to use pneumatic lifts for servicing coordinate boring machines.

In premises for machines with numerical control, a low-resistance grounding busbar must be installed, to which grounding wires of the control cabinets with numerical control should be connected. The electrical resistance of the grounding circuit must not exceed 4 ohms.

In workshops with foundry equipment, a reinforced supply-exhaust ventilation system should be installed to extract dust and gas from working zones and supply fresh air. In addition, special pipelines with silencers should be provided to remove exhausted compressed air from pneumatic machines in working zones to prevent temperature drop, increased noise levels, and dust contamination in the work areas.

1. What is the primary requirement for storing and using metal-cutting machines and forging-press equipment in terms of temperature?

2. What is the maximum allowable air temperature deviation for machines of class A?

3. How should machines that emit abrasive or metal dust be equipped to protect the air?

4. Why is it not recommended to install machines of different types from classes B, A, and C in the same room?

5. What type of heating system is considered the best for rooms with equipment of classes B, A, and C?

6. What must be done to maintain the acceptable temperature

range in premises with machines of classes N and P during winter?

7. What type of ventilation system should be used in rooms with foundry equipment to ensure air quality?

8. What is the maximum allowable electrical resistance for the grounding circuit in rooms with machines that have numerical control systems?

Task 4. Read the statements and decide if they are true (T) or false (F).

1. Machines of classes N and P can be installed in general production areas without any special requirements.

2. The temperature in rooms with machines of class A should remain within ±5°C from the nominal temperature.

3. It is acceptable to place machines working with abrasive tools in the same room as machines using metal tools.

4. For rooms with equipment of classes B, A, and C, the ventilation system must include a device for heating the air.

5. The best type of heating system for rooms with class B, A, and C equipment is water heating with radiators placed no closer than 1 meter from the machines.

6. During the winter, rooms with machines of classes N and P can be heated using any type of centralized heating system.

7. The lighting in machine rooms must comply with artificial lighting standards for industrial enterprises.

8. In rooms with foundry equipment, it is not necessary to install a reinforced supply and exhaust ventilation system.

SPEAKING

Task 5. Answer the questions in full sentences.

1. What are the necessary conditions for storing and using machines to maintain their initial technical parameters?

2. Why is it important to install machines in separate rooms when using abrasive tools?

3. What is the acceptable air temperature range for rooms with machines of class B, A, and C?

4. What type of heating system is recommended for rooms with machines of class B, A, and C?

5. What ventilation system is required in rooms with foundry equipment, and why is it necessary?

Task 6. Choose the correct answer for each question.

1. What is necessary for storing machines to maintain their initial technical parameters?

a) Exposure to external weather conditions
b) Installation in closed, heated rooms
c) Installation in open, unprotected areas
d) No specific conditions required

2. Which type of equipment must be installed in separate rooms when using abrasive tools?

a) Machines of class B
b) Machines using abrasive tools
c) Machines of class N
d) Machines using metal tools

3. What is the recommended temperature range for rooms with machines of class B, A, and C?

a) 15-18°C *b) 20°C*
c) 20°C ±1°C for class A *d) 25°C*

4. Which heating system is most suitable for rooms with equipment of class B, A, and C?

a) Radiator heating *b) Water heating*
c) Air heating *d) Electric heating*

5. What is required in rooms with foundry equipment to ensure proper air quality?

a) Air conditioning
b) Air filtration and exhaust ventilation
c) Heating systems
d) No special requirements for ventilation

SPEAKING

Task 7. Prepare a short presentation (2-3 minutes) on one of the following topics. Use simple language and try to include examples to illustrate your points. After your presentation, be ready to answer a few questions from your groupmates or teacher.

Topics:

1. **The Importance of Proper Machine Maintenance in Manufacturing**

– Discuss the role of machine maintenance in ensuring the efficiency and longevity of manufacturing equipment. Provide examples of maintenance strategies used in different industries.

2. **The Role of Automation in Modern Production**

– Explain how automation has transformed production processes. Include examples of automated systems used in factories and how they improve productivity and safety.

3. **Safety Measures in Machine Operations**

– Discuss the key safety protocols and practices in machine operation, including personal protective equipment (PPE), machine guarding, and training for operators.

4. **The Impact of Precision Engineering on Machine Performance**

– Explain how precision engineering contributes to the accuracy and efficiency of machines. Provide examples of industries where high precision is crucial, such as aerospace or medical equipment manufacturing.

5. **The Future of Machine Design and Innovation**

– Explore emerging trends in machine design, such as smart machines, 3D printing, and sustainable technologies. Discuss how these innovations may shape the future of manufacturing.

WRITING

Task 8. Write a short paragraph (4-5 sentences) about the role of automation in modern production. Use the following words.

Efficiency, productivity, systems, processes, technology

3.2. Arrangement of foundations and installation of machines

VOCABULARY

Task 1. Match the words with their definitions.

1. Vibration	**a.** A base or support structure designed to stabilize and secure machines.
2. Foundation	**b.** The act of setting up or positioning machinery for use.

3. Accuracy	**c.** The ability of a machine to perform tasks with minimal deviation or error.
4. Rigidity	**d.** The process of reducing or eliminating the transfer of external forces.
5. Cement	**e.** A material used to construct and solidify foundations, often combined with water and sand.
6. Isolation	**f.** The state of being firm and resistant to bending or deformation.
7. Equipment	**g.** The assessment of a machine or structure to ensure proper functioning.
8. Anchorage	**h.** Movements or oscillations caused by external or internal forces.
9. Installation	**i.** Tools or machinery used to perform specific tasks.
10. Inspection	**j.** A method of securing machines to prevent movement during operation.

WRITING

Task 2. Complete the sentences using the correct vocabulary word from the list.

Vibration, Foundation, Accuracy, Rigidity, Cement, Isolation, Equipment, Anchorage, Installation, Inspection.

1. The machine must be placed on a stable _____ to ensure proper operation.

2. To reduce external _____ , the workshop installed vibration-damping supports.

3. During the _____ process, technicians carefully follow the manufacturer's instructions.

4. High _____ is essential for machines used in precision manufacturing.

5. The _____ of the machine's frame prevents it from deforming under heavy loads.

6. Regular _____ of the equipment is necessary to ensure safety and efficiency.

7. The _____ of the machinery to its base helps prevent unwanted

movement during operation.

8. For construction, the workers used high-quality _____ to create a durable foundation.

9. Special _____ is required to install heavy industrial machines safely.

10. Vibration _____ is crucial to prevent interference from nearby equipment.

READING

Task 3. Read the text and answer the questions.

ARRANGEMENT OF FOUNDATIONS AND INSTALLATION OF MACHINES

Metal-cutting machines must be protected from vibrations caused by nearby equipment, unbalanced moving masses, and transportation. Partial vibration damping can be achieved with separate foundations or vibration-isolating supports. Guidelines for foundation arrangements are usually provided by manufacturers.

Key factors for foundation choice include equipment accuracy, operational loads, structure stiffness, and mass. Class C machines require concrete foundations with springs and dampers, while class A and B equipment are installed on individual concrete bases with vibration isolation. Light and medium machines with rigid beds can use general concrete floors with vibration supports.

Machines can be installed on Portland cement foundations after seven days, with operation allowed after 22 days. Protective treatments prevent damage from lubricants, and unpacking should follow strict guidelines to avoid equipment damage.

Precision machines often use adjustable supports for alignment without anchor bolts. Machines with reciprocating movements need anchor bolts and cemented bases, with operation allowed after 72 hours. Post-installation, equipment undergoes testing, run-in periods, and accuracy checks before commissioning. After 200 hours, lubrication systems are cleaned and refilled, marking the start of normal operation.

1. Why is it important to protect metal-cutting machines from external vibrations?

2. What are some common sources of vibrational disturbances affecting machines?

3. What is one method mentioned in the text for reducing vibrations transmitted through the ground?

4. Which factors should be considered when selecting a foundation type for a machine?

5. Why are massive concrete foundations with dampers recommended for class C machines?

6. How should small and lightweight equipment be unpacked according to the text?

7. What is the purpose of conducting inspections after the installation of machines?

8. How long should equipment with a cement foundation wait before being operational?

Task 4. Read the statements and decide if they are true (T) or false (F).

1. Machines should be installed directly on the concrete floor without vibration isolation for all machine classes.

2. Massive concrete foundations with springs and dampers are the most expensive, but recommended for class C machines.

3. Machines with reciprocating movements should be mounted on anchor bolts and the base poured with cement.

4. Equipment should be unpacked manually, regardless of size or weight.

5. It is permissible to use sling chains to lift unpacked machines.

6. The foundation for machines can be built using regular cement and equipment can be installed after seven days.

7. After assembly, all lubrication points on the machine should be filled with oil according to the lubrication diagram.

8. All machines undergo a 200-hour inspection after commissioning, including cleaning and refilling lubrication points.

SPEAKING

Task 5. Answer the questions in full sentences.

1. Why is it important to protect metal-cutting machines from vibrational disturbances?

2. How can vibrations be minimized during machine installation?

3. What factors should be considered when choosing the type of foundation for machine installation?

4. What is the recommended waiting period before a machine can be put into operation after its foundation is installed?

5. How should the unpacking process of machines be carried out to avoid damage?

Task 6. Choose the correct answer for each question.

1. What is the primary reason for using vibration isolation in machine installation?

a) To reduce the size of the machine

b) To protect machines from external vibrational disturbances

c) To increase machine weight

d) To make machine parts easier to assemble

2. Which of the following is the best type of foundation for Class C machines?

a) Wooden foundations

b) Concrete foundation on springs with dampers

c) Air gap without vibration support

d) Metal foundations

3. When can a machine be installed on a foundation made with regular Portland cement?

a) Immediately after pouring the cement

b) No earlier than seven days after pouring the cement

c) After one month

d) Only if using quick-setting cement

4. What should be done during machine unpacking to prevent damage?

a) Use a forklift for all machines

b) Lift unpacked machines with sling chains

c) Use protective fabric pads between cables and the machine's surface

d) Unpack all machines manually without precautions

5. How long should a forging, pressing, or casting machine undergo a run-in period before full operation?

a) 1-2 hours

b) 7-8 hours in idle mode and 50-60 hours under load
c) 24-48 hours in idle mode
d) 100-150 hours in idle mode

SPEAKING

Task 7. Prepare a short presentation (2-3 minutes) on one of the following topics. Use simple language and try to include examples to illustrate your points. After your presentation, be ready to answer a few questions from your groupmates or teacher.

Topics:

1. **The Importance of Proper Machine Installation and Foundation Arrangement in Manufacturing**

– Explain how installing machines correctly and choosing the right foundation can improve efficiency and reduce problems in production.

2. **Vibration Isolation: Why It's Important for Precision Machinery**

– Discuss the impact of vibrations on machine accuracy and the methods used to minimize vibrations, such as using separate foundations or special supports.

3. **The Role of Regular Maintenance and Testing in Ensuring Machine Performance**

– Highlight the importance of routine maintenance and testing for machinery, including checking lubrication points, ensuring proper alignment, and run-in periods.

4. **Types of Machine Foundations and Their Applications**

– Describe the different types of foundations (e.g., concrete foundations, vibration isolators) and which types of machines need them based on their class and purpose.

5. **The Process of Unpacking and Installing Heavy Machinery Safely**

– Explain the correct procedures for unpacking and installing large machines, including safety precautions and the use of lifting equipment like overhead cranes.

WRITING

Task 10. Write a short paragraph (4-5 sentences) about the importance of proper foundation arrangement and machine installation. Use the following words.

Vibration, accuracy, foundation, installation, equipment.

3.3. Working on machines.

VOCABULARY

Task 1. Match the words with their definitions.

1. Precision machine	**a.** A tool used for smoothing or finishing surfaces with abrasive action.
2. Fastener	**b.** A component or tool used to secure workpieces during operation.
3. Reaming	**c.** The process of enlarging a hole to a precise diameter.
4. Coordinate-boring machine	**d.** A worker trained and certified to operate specific machines safely and efficiently.
5. Grinding wheel	**e.** A worker who has undergone training to understand machine operation and safety protocols.
6. Safety training	**f.** A device used for precision hole boring in a workpiece.
7. Spacers	**g.** A material used to cool or lubricate machines during operation, preventing overheating.
8. Coolant	**h.** A part or item that is being worked on or processed in a machine.
9. Workpiece	**i.** A machine used to finish holes, ensuring they are accurately placed.
10. Certified operator	**j.** Objects placed between workpieces and machine surfaces to protect precision components.

WRITING

Task 2. Complete the sentences using the correct vocabulary word from the list.

Precision, Fastener, Reaming, Coordinate-boring machine, Grinding wheel, Safety training, Spacers, Coolant, Workpiece, Certified operator.

1. The _____ is a key component used to secure the workpiece in place during machining operations.

2. Before operating the machine, the workers must undergo _____ to ensure they follow safety protocols.

3. A _____ is used to finish the surface of a workpiece, removing any rough edges.

4. When creating precise holes, a _____ machine is used to ensure the holes are perfectly aligned.

5. _____ should be added to the machine to cool down the components and prevent overheating.

6. The _____ is the part being worked on in the machining process, such as a metal or plastic part.

7. For accurate hole enlargement, the process of _____ ensures the holes are the correct size.

8. A _____ machine is designed for operations requiring high accuracy and specific tolerances.

9. _____ are used to separate the machine parts to avoid direct contact and prevent damage.

10. Only a _____ can safely and efficiently operate complex machinery in a production environment.

READING

Task 3. Read the text and answer the questions.

WORKING ON MACHINES

Equipment should only be used for its intended purpose as outlined in the technical documentation. The types of operations that can be performed depend on the machine's purpose, precision, surface finish, and maximum load capacity. Machines of classes B, A, and C should only perform the tasks specified in the factory manuals.

Higher precision machines should not be used to make parts that can be processed on lower-class machines with the required precision. Workpieces should not exceed the maximum weight specified in the documentation to avoid premature wear. This is especially crucial for precision machines where wear tolerance is very low.

Preliminary hole processing for reaming should be done on normal precision machines, leaving a margin of 2-2.5 mm for final reaming. Workpieces on coordinate-boring machines should not exceed the size of the machine table.

It is prohibited to over-tighten fasteners with extended wrenches, and workpieces should not be placed directly on machine surfaces, especially precision machines. Workpieces on coordinate-boring machines should be placed on hardened, ground spacers.

When using grinding wheels, safety rules must be followed. Grinding wheels should be balanced and tested before use, and coolants that damage the wheel bond are prohibited. Only sharp tools should be used, and tool and accessory surfaces must be checked regularly.

Only qualified workers who have completed safety training and received certification are allowed to operate metalworking machines. Specially trained technicians are required for setting up NC machines, and safety training is mandatory for operators of forging-press machines.

1. What is the primary function of a fastener in machine operation?

2. Why is safety training important for workers operating machinery?

3. What is the purpose of a grinding wheel in the machining process?

4. How does a coordinate-boring machine help in maintaining accuracy?

5. Why is coolant necessary during machining operations?

6. What is the role of a workpiece in the machining process?

7. What is the reaming process used for in machining?

8. Why is it essential for operators to be certified before using complex machines?

Task 4. Read the statements and decide if they are true (T) or false (F).

1. All machines can be used for any type of operation, regardless of their intended purpose.

2. It is important to follow the machine's technical documentation to avoid using equipment for unintended tasks.

3. Machines of classes B, A, and C can be used for any work mentioned in the factory manuals.

4. Precision machines can be used to process parts that do not meet the required accuracy parameters.

5. The maximum allowable weight for a workpiece should not exceed the limits specified in the machine's technical documentation.

6. When processing small workpieces on machines, it is recommended to periodically change the position of the workpieces to ensure even wear.

7. Using excessive torque to tighten workpiece mounting nuts is acceptable if needed.

8. Only qualified workers with special training should operate metalworking and woodworking machines.

SPEAKING

Task 5. Answer the questions in full sentences.

1. What should be considered when selecting the type of foundation for machine installation?

2. Why is it important to follow the manufacturer's instructions during machine unpacking and installation?

3. How should you handle large, heavy machines when lifting them for installation?

4. What is the recommended procedure for ensuring proper operation of precision machines after installation?

5. What actions should be taken to maintain the accuracy and longevity of high-precision machines?

Task 6. Choose the correct answer for each question.

1. What is the primary role of machine maintenance in manufacturing?

a) To increase production speed
b) To extend the lifespan and efficiency of machines
c) To reduce energy consumption
d) To decrease worker safety

2. Why are machine foundations important in manufacturing?

a) To increase machine noise
b) To improve stability and reduce vibrations
c) To make machines more portable
d) To improve the aesthetic appearance of the workspace

3. What is one key safety measure when operating metalworking machines?

a) Wearing protective clothing and gloves
b) Working without supervision
c) Ignoring maintenance schedules
d) Using machines at maximum speed

4. How do precision machines affect product quality?

a) They ensure high levels of accuracy and consistency
b) They are used only for basic tasks
c) They reduce product durability
d) They increase production time

5. What is a key benefit of automation in modern manufacturing?

a) It increases human error
b) It reduces the need for skilled labor
c) It increases productivity and reduces errors
d) It eliminates the need for machines

SPEAKING

Task 7. Prepare a short presentation (2-3 minutes) on one of the following topics. Use simple language and try to include examples to illustrate your points. After your presentation, be ready to answer a few questions from your groupmates or teacher.

Topics:

1. **The Importance of Machine Maintenance in Manufacturing**

– Discuss why regular maintenance is crucial for the longevity and efficiency of machines in a production environment. Include examples of how proper maintenance prevents breakdowns and ensures safety.

2. **Types of Machine Foundations and Their Role in Machine Operation**

– Explain the different types of foundations used for machine installation and how they help in reducing vibrations, ensuring precision, and increasing the stability of machines.

3. **Safety Measures When Operating Metalworking Machines**

– Describe the safety precautions workers should take when operating metalworking machines. Discuss protective equipment, proper training, and safety guidelines to avoid accidents.

4. **How Precision Machines Impact Product Quality**

– Explain the role of precision machines in achieving high-quality, accurate products. Include examples of industries that rely on precision machining, such as aerospace and automotive.

5. **The Role of Automation in Modern Manufacturing**

– Discuss how automation has transformed manufacturing processes. Explain the benefits of automated machines, such as increased productivity, reduced human error, and cost savings.

Task 8. Write a short paragraph (4-5 sentences) about the importance of machine operation and maintenance in manufacturing. Use the following words.

Efficiency, precision, safety, maintenance, productivity.

UNIT 4. The Concept of Designing Agricultural Machinery

VOCABULARY

Task 1. Match the words with their definitions.

1. Agricultural machinery	**A.** The effectiveness and efficiency of agricultural machinery in terms of its operational capabilities and cost-effectiveness.

2. Design documentation	**B.** Mechanized tools and equipment designed for various processes in agricultural production, including soil cultivation, sowing, and harvesting.
3. Technical and economic performance	**C.** The specific depth at which seeds are planted in the soil, which is critical for optimal crop yield and is subject to precision requirements.
4. Soil and climatic conditions	**D.** The process by which agricultural machinery compresses soil, leading to reduced air and moisture penetration and potentially decreasing soil fertility.
5. Productivity improvement	**E.** Technical and design materials created for new types and models of agricultural machinery, including diagrams, charts, and specifications.
6. Reliability and durability	**F.** Regulations that ensure the safety and hygiene of agricultural machinery operations, protecting both workers and the environment.
7. Seeding depth	**G.** Efforts aimed at increasing the output or efficiency of agricultural processes through better machinery design and functionality.
8. Soil compaction	**H.** The specific environmental factors and characteristics of the soil in agricultural zones that affect machinery design and operation.
9. Environmental interaction	**I.** The ability of agricultural machines to operate consistently over time without significant breakdowns or the need for repairs.
10. Unified safety standards	**J.** The effect that agricultural machinery has on the ecosystem, including soil health and fertility, due to its operational practices.

WRITING

Task 2. Complete the sentences using the correct vocabulary word from the list.

Agricultural Machinery, Design Documentation, Technical and Economic Performance, Soil and Climatic Conditions, Productivity Improvement, Reliability and Durability, Seeding Depth, Soil Compaction, Environmental Interaction, Unified Safety Standards

1. _____ refers to the ability of agricultural machines to operate over time without frequent breakdowns.

2. To ensure safety and hygiene in operations, _____ are implemented globally.

3. The depth at which seeds are planted, known as _____, directly impacts crop yields.

4. Farmers must consider _____ to ensure machinery functions optimally in varying regions.

5. Designing diagrams and specifications for new machinery is part of _____.

6. The process of compressing soil during machinery operation, which reduces air and moisture penetration, is called _____.

7. Efforts to increase efficiency and output in farming are part of _____.

8. _____ evaluates how effective and cost-efficient agricultural machinery is in performing tasks.

9. The impact of agricultural machinery on soil health and the broader ecosystem is referred to as _____.

10. _____ includes tools and equipment used for processes like sowing, harvesting, and soil cultivation in agriculture.

READING

Task 3. Read the text and answer the questions.

THE CONCEPT OF DESIGNING AGRICULTURAL MACHINERY

Designing agricultural machinery and equipment involves developing mechanized tools to perform various technological processes (soil cultivation, sowing, crop care, harvesting, etc.) in agricultural production. The operational conditions of these machines significantly influence their design features.

The process of designing agricultural machinery entails creating design and technical documentation for new types and models of agricultural machines and tools. This includes technical and economic calculations, diagrams, charts, models, explanatory notes, specifications, and descriptions. Specialists in design organizations, research institutes, and design bureaus at factories are responsible for this work.

Addressing Specific Challenges in Designing Agricultural Machinery

To enhance food production and supply raw materials for industry, it is crucial to develop agricultural machinery with high technical and economic performance, meeting the following criteria:

– Adaptation to the soil and climatic conditions of specific agricultural zones.

– Compatibility with farming practices.

– Alignment with agricultural crop production technologies.

Key requirements for developing new agricultural machines and modernizing existing ones include:

– Improving productivity.

– Enhancing the quality of technological processes.

– Increasing reliability and durability (ensuring operation for 3–4 seasons without repairs, except for replacing wear-prone parts).

– Adhering to unified safety and labor hygiene standards.

The primary goal for agricultural machinery designers is to create machines that operate reliably throughout the entire operational season.

Examples of Engineering Challenges in Agriculture

1. Ensuring seeds are sown into adequately moistened and evenly loosened soil at a uniform depth within optimal agrotechnical timelines, which significantly impacts crop yield.

2. Maintaining consistent seeding depth. For grain crops, deviations from the set depth should not exceed ±0.5 cm for depths up to 4 cm and ±1.0 cm for depths over 4 cm. However, for high-yield dwarf wheat varieties, the optimal depth is 1.5–2.0 cm, which is challenging for existing seed drills. A compromise depth of 4–5 cm is often chosen, affecting yield.

Environmental Impact of Agricultural Machinery

Designing agricultural machinery also considers its interaction with the environment. All machines impact the environment differently, but a common effect of mobile machinery is soil deformation and compaction by energy tools like tractors. According to GOST 26955-86, agricultural machinery and other equipment weighing more than 10 tons should not enter fields, as they compact the soil to depths of up to 1 meter. While soil is typically plowed to a depth of 35–40 cm, the subsoil layer becomes over-compacted, reducing microorganism activity due to limited moisture and air penetration, ultimately decreasing soil fertility.

1. What are some of the key technological processes that agricultural machinery is designed to perform?

2. Who is responsible for creating the design and technical documentation for agricultural machinery?

3. What are the main criteria for developing agricultural machinery with high technical and economic performance?

4. What are some of the key requirements when developing new agricultural machines or modernizing existing ones?

5. What is the primary goal for agricultural machinery designers when creating new machines?

6. What challenge is associated with ensuring seeds are sown at a uniform depth in agricultural production?

7. How does the seeding depth for high-yield dwarf wheat varieties differ from other crops, and why is it a challenge for existing machinery?

8. What environmental impact is commonly caused by agricultural machinery, and how does it affect soil fertility?

Task 4. Read the statements and decide if they are true (T) or false (F).

1. Agricultural machinery is only designed for soil cultivation and harvesting, not for crop care or sowing.

2. The operational conditions of agricultural machinery do not affect its design features.

3. Specialists in design organizations and research institutes are responsible for creating design and technical documentation for new

agricultural machinery.

4. One of the key criteria for agricultural machinery design is its adaptation to soil and climatic conditions.

5. The primary goal of designing agricultural machinery is to ensure that machines do not require repairs for at least 5–6 seasons.

6. The seeding depth for grain crops should not deviate more than ±1.0 cm for depths over 4 cm.

7. Agricultural machinery impacts the environment in a way that can reduce soil fertility, particularly due to soil compaction by tractors.

8. The GOST 26955-86 regulation states that agricultural machinery weighing more than 10 tons should be allowed to enter fields for soil plowing.

SPEAKING

Task 5. Answer the questions in full sentences.

1. What are the main technological processes that agricultural machinery is designed to perform?

2. Who is responsible for creating the design and technical documentation for new agricultural machinery?

3. What are the key requirements when designing new agricultural machinery or modernizing existing ones?

4. How does the soil and climatic conditions of specific agricultural zones influence the design of agricultural machinery?

5. What is the environmental impact of agricultural machinery, particularly with regard to soil compaction?

Task 6. Choose the correct answer for each question.

1. What is the primary goal of designing agricultural machinery?

a) To ensure machinery operates without repairs for several seasons

b) To increase machinery weight for better traction

c) To reduce the cost of labor in farming

d) To decrease environmental impact by using less fuel

2. Which of the following is a key factor when designing agricultural machinery for specific regions?

a) The machinery's ability to adapt to soil and climatic

conditions

b) The machine's ability to travel at high speeds

c) The cost of manufacturing materials

d) The size of the machine relative to the farmer's land

3. What is one of the significant challenges in designing agricultural machinery?

a) Achieving consistent seeding depth

b) Increasing the weight of machinery

c) Ensuring machines are easy to transport

d) Making the machines more colorful and attractive

4. How do environmental concerns influence agricultural machinery design?

a) Machinery must be designed to avoid soil compaction and preserve soil health

b) Machines are designed with larger engines to reduce pollution

c) Machinery designs focus on maximizing fuel consumption

d) Environmental impact is not a concern in machinery design

5. Why is it important to ensure that agricultural machinery operates reliably for the entire season?

a) To minimize the cost of repairs and improve productivity

b) To allow farmers to use the machinery as decoration

c) To reduce the need for specialized labor

d) To increase the weight of the machinery for better soil tillage

SPEAKING

Task 7. Prepare a short presentation (2-3 minutes) on one of the following topics. Use simple language and try to include examples to illustrate your points. After your presentation, be ready to answer a few questions from your groupmates or teacher.

Topics:

1. **The Role of Agricultural Machinery in Increasing Crop Production**

– Discuss how different types of machinery, such as tractors and harvesters, help improve efficiency and crop yields. Provide

examples of machines used in sowing, cultivation, and harvesting.

2. **How Environmental Conditions Affect Agricultural Machinery Design**

– Explain how soil type, climate, and terrain influence the design and operation of agricultural machinery. Include examples of machines adapted for different farming environments.

3. **The Importance of Seeding Depth in Agricultural Machinery**

– Discuss why the correct seeding depth is critical for crop growth and how machinery is designed to ensure precision. Provide examples of machinery that focus on seeding depth accuracy.

4. **The Impact of Agricultural Machinery on Soil Health**

– Explore how machinery can affect soil compaction and fertility. Discuss both the positive and negative effects of machinery on the environment, with examples of design improvements to reduce soil damage.

5. **Safety Standards in Agricultural Machinery Design**

– Explain the importance of safety standards in the design of agricultural machinery. Discuss how these standards protect both the environment and the workers using the machinery, with examples of safety features.

Task 8. Write a short paragraph (4-5 sentences) about the concept of designing agricultural machinery. Use the following words.

Design Documentation, Productivity, Reliability, Soil Conditions, Safety Standards.

Make sure your paragraph clearly explains the role of designing agricultural machinery, including how these aspects contribute to the effectiveness and efficiency of the machines.

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