

DESCRIPTION OF MODULE

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[Industrial Technology]

Aim	The student is able to independently manage the technological processes of wood processing in order to ensure high quality (compliant with quality requirements) and efficient work process.
Tasks (Learning outcomes)	<p><i>The workplace matches the competence and duties:</i> <i>choose raw materials;</i> <i>manage and monitor production (monitor production processes);</i> <i>ensure the quality of the product.</i></p> <p>The student is able to: choose raw materials that meet production specifics and quality requirements.</p> <p>Knows: types, specifics and quality requirements of raw materials (grades, dimensions, humidity, types of wood, problem areas (+ what causes them). (Raw materials = roundwood, lumber, plywood.)</p> <p>Understands: impact of raw material properties and quality on production technological processes and products (cause and effect). Understands the ways to apply acquired knowledge in production conditions.</p> <p>The student is able to: manage and monitor production (monitor production processes); provide efficient and high quality production technological cycle for various products. (product = lumber, plywood, tare boards, by-products (chips, briquettes, chips)).</p> <p>Knows: production technology for various wood products; technological equipment and its operation (maintenance, proper use), main components. (technological equipment = machine, conveyor, dryer, lifting device, etc.).</p> <p>Understands: Relation between different technological processes and their impact on production efficiency (equipment load, example = thicker belt on a band-saw increases power, but makes calibration problematic).</p> <p>Is able to: ensure the quality of the product; ensure compliance with the quality of the production process and recognize, as well as eliminate the risks of quality mismatch.</p> <p>Knows: product quality requirements at different stages of the production process; causes of manufacturing defects and ways to prevent them.</p> <p>Understands: the causal relationship between production technology, equipment and instruments (technical condition, specifications, maintenance) and its impact on production quality.</p>
Assessment form	<p>1. Within a module, during the learning process, the trainee prepares a description of the quality of the raw materials and at the end of the module describes how raw materials quality influences the production process and end result.</p> <p>2. Within the module, prepares the scheme of technological process and functional parameters <i>(equipment settings, processing parameters, cutting tool parameters, productivity, and raw material characteristics)</i> of the equipment.</p> <p>At the end of the module, the trainee presents an analysis of the production technological processes and proposals for improving efficiency.</p>



	<p>3. During the module, the trainer monitors the adequacy of technological processes to ensure product quality. At the end of the module the learner identifies the major quality mismatches and makes proposals for their timely elimination.</p>
<p>Role in curricula</p>	<p>To be presented after all the modules are developed.</p>

CONTENT OF MODULE

Learning outcomes	Topics	Content (suggested)	Units	Assessment of acquired learning outcomes (optimal level)	Methods and ideas for learning process	
<p>1. The trainee is able: - to choose raw materials that meet the production specifics and quality requirements. Knows: types, specifics and quality requirements for the raw materials (grades, dimensions, humidity, types of woods, problematic areas (+ what causes them). (Raw materials = roundwood, lumber, plywood) Understands: - impact of raw materials properties and quality on production processes and end products (causal relationships). Understands how to apply acquired knowledge in production conditions.</p>	<p>1.1. Types and quality of round timber (Forestry)</p> <p>1.2. Types and quality of wood materials</p>	<p>1.1.1. Round timber as raw material for woodworking</p> <p>1.1.2. Round timber: quality requirements, defects, measurement</p> <p>1.1.3. How logging processes impact the quality of round timber</p> <p>1.2.1. Macroscopic features and properties of wood</p> <p>1.2.2. Sawn timber classification, quality requirements, defects, measurement</p> <p>1.2.3. Types of plywood, quality requirements, defects and its measurement</p> <p>1.2.4. Wood panel materials: quality requirements and application</p> <p>1.2.5. Energy wood: types and quality requirements</p>	<p>1</p>	<p>Name round timber assortment suitable for wood product manufacturing.</p> <p>Identify the main quality requirements and wood faults, estimate them and define the quality of the round timber.</p> <p>Analyze and describe the impact of mechanical damage on the quality of round timber and the useful yield of wood to be produced.</p> <p>Describe macroscopic properties of various sorts of wood, its use and impact on the processing.</p> <p>Visually estimate, measure and describe the quality of lumber.</p> <p>Visually estimate, measure and describe the sort of quality of a given sheet of plywood.</p> <p>Describes the types of wood panels, their physical-mechanical properties and possible use.</p> <p>Describe types of energy wood, its most important characteristics and production processes.</p>	<p>The students learn about the types of round timber and its use in the woodworking industry. They also discuss assortment acquisition and use in their companies.</p> <p>The students measure the samples of the round timber and determine their compliance with the quality requirements.</p> <p>The students learn about the results of the research on the impact of logging processes on the quality of round timber.</p> <p>The students study theoretical materials about the timber macroscopic properties and analyze their impact on woodworking processes and the types of products where this wood is used.</p> <p>The students sort lumber samples according to the requirements of theoretical contract between the customer and supplier.</p> <p>The students sort the plywood samples according to the set quality requirements.</p> <p>The students get acquainted with different wood panels and study theoretical materials about its properties and applications.</p> <p>The students get acquainted with samples of different types of energy wood and test of its characteristics in the laboratory. The students study theoretical materials about the types of wood used in pulp</p>	



		1.2.6. Wood for pulp production: types and quality requirements		Describe the types of wood intended for pulp production and applicable quality requirements.	production and the quality requirements set for it.	
2. Is able to: - provide efficient and high-quality production technological cycle of various products. Knows: production technology for various wood products; technological equipment and its operation (maintenance, proper use), main components. (technological equipment = machine, conveyor, dryer, lifting device, etc.). Understands: Relation between different technological processes and their impact on production efficiency (equipment load, example = thicker belt on a band-saw increases power, but makes calibration problematic).	2.1. Production of sawn timber	2.1.1. Production of sawn timber: technologies, machinery, cutting tools. 2.1.2. Lumber sawing techniques, basic principles of creating a sawing plan; software for creating a computerised sawing plan 2.1.3. Lumber drying equipment and technology of drying process 2.1.4. Methods of sorting the lumber 2.1.5. Packaging and marking of lumber	Compare and explain the advantages and disadvantages of different technological lines and machine tools. Make proposals for the replacement of equipment and cutting tools at the sawmill production with the aim to increase production efficiency. Create an optimal sawing plan, compare and analyze the advantages and disadvantages of various lumber sawing methods. Describe the types of sawn lumber drying equipment available on the market, its main parameters, operating principles, advantages and disadvantages. Describe the mechanized lumber sorting lines on the market, their main parameters, advantages and disadvantages. Give examples of requirements for the packaging of lumber, depending on the type of transportation, country of destination and specific customer requirements. Describes the technology and aspects of plywood production in the future depending on the type of production and the type of raw material. Describes quality requirements for raw material preparation,	The students learn about real or theoretical sawn lumber production, production lines and/or machinery there. Make proposals for the replacement of equipment and cutting tools in real or theoretical sawn lumber production with the aim of increasing production efficiency. The students create a sawing plan using sawing or scouring, and then compare the resulting yield. The students get acquainted with theory and actual drying equipment at the sawmill factory. Evaluate its efficiency and compliance with the specific lumber factory conditions. The students also develop proposals for improving drying. The students learn about the mechanized sorting line for sawn timber at the real or theoretical factory. Assess its effectiveness and compliance with the needs of a particular production. Offer proposals for improvement of sorting processes and technologies. The students examine the types of sawn timber packaging depending on the type of transportation, country of destination, and customer requirements. The students learn about the available literature independently and prepare an overview of peeled and shelled raw materials for plywood or any further use. The students study theoretical materials on plywood production requirements, technologies, equipment and operating principles, as well the basic scheme of peeling process – indicating the most		
	2.2. Plywood production	2.2.1. Plywood description and basic methods of its production 2.2.2. Timber preparation for peeling and plywood shelling				



		<p>2.2.3. Transportation and crushing of shelled plywood</p> <p>2.2.4. Importance, principles and process of plywood drying</p> <p>2.2.5. Dry plywood: defects and sorting</p> <p>2.2.6. Normalization of plywood quality and size</p> <p>2.2.7. Plywood bonding: types of adhesives, application of adhesives, stacking the plywood, cold pressing</p> <p>2.2.8. Plywood: applying the glue and pressing</p> <p>2.2.9. Plywood cutting, lubrication, finishing</p> <p>2.2.10. Plywood finishing options</p>	<p>compares types of hydrothermal treatment of veneer logs, their advantages and disadvantages. Describes the most important parameters of the technological process of peeling, the effect of their changes on peeling process efficiency and plywood quality.</p> <p>Describe the crumbling principles and options of peeled plywood.</p> <p>Compare the plywood drying methods, their advantages and disadvantages. Describe the most important parameters of the plywood drying process and how parameters' changes impact the process efficiency and quality.</p> <p>Describe the most common plywood defects, the importance of plywood sorting and technological requirements. Use samples and visuals to determine the defect of the plywood and explain the cause.</p> <p>Explain the importance of plywood normalization; describe its types and processes.</p> <p>Describes the glues used in plywood production and their impact on the strength of the joints under various environmental conditions. Name the types of glue applications and technological parameters of the process.</p> <p>Describe the types of plywood gluing and pressing, the importance of plywood pre-pressing and plywood pressing technology.</p> <p>Describe the importance of plywood cutting, lubrication and sanding; describe applied technologies and</p>	<p>essential requirements for hydrothermal treatment of timber.</p> <p>The students get acquainted with the process of peeled plywood crumbling and transportation, the basic schemes of plywood conveyor and cutting, its main elements and the importance of plywood crumbling.</p> <p>The students learn about methods, equipment and operation of plywood drying at real or theoretical production facility.</p> <p>The students get acquainted with information and visual samples regarding plywood defects and sorting methods, equipment and operation, as well as analyze the causes of the defects.</p> <p>The students learn about the technology and importance of plywood size and quality normalization.</p> <p>The students receive information and study different types of glue and their application in different weather conditions and for different processing. The students learn about glue application technology, parameters and equipment for process implementation.</p> <p>The students learn about plywood pressing technology, equipment and its operating principles, as well as key plywood pressing parameters.</p> <p>The students get acquainted with the types and significance of plywood cutting, lubrication and grinding, equipment and operation principles and causes of the most common plywood defects and their prevention.</p>	
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	<p>2.3. Fibreboard manufacturing</p>	<p>2.2.11. Plywood packaging and marking</p> <p>2.3.1. Fibreboards: characteristics, principles of production and types of raw materials</p> <p>2.3.2. "Wet" fibreboard production:</p> <ul style="list-style-type: none"> • Woodchip production • Wood fibre production and pulp preparation • Preparing the glue • Mixing the wood pulp with adhesives and shaping of fibreboard • Hot-pressing the fibreboard • Processing after pressing – hot treatment, wetting, shaping, storage <p>2.3.3. "Dry" fibreboard production:</p> <ul style="list-style-type: none"> • Preparation of pulp mass • Adding paraffin and binders • Drying of wood fibres • Forging and pre-pressing the fibreboard • Pressing the fibreboard in a hot press • Technological process after pressing – fibreboard 		<p>the importance of further processing of plywood.</p> <p>Describes the types of plywood finishing and its application depending on the use of the final product. Using visual aids, explain the applied finishing and how the product can be used.</p> <p>Describe examples of plywood packaging requirements, depending on the type of transportation, destination point, state or specific customer requirements.</p>	<p>The students learn about plywood finishing technologies and equipment.</p> <p>The students receive information and study examples of plywood packaging depending on the transportation type, destination country and specific customer requirements.</p>	
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	<p>2.4. Chipboard production</p>	<p>conditioning, cutting, storage</p> <p>2.3.4. Special fibreboard and its production:</p> <ul style="list-style-type: none"> • Very firm boards • Soft boards • Refractory boards • Bio-resistant boards • Soundproofing boards <p>2.3.5. Fibreboard finish</p> <p>2.3.6. Fibreboard: quality requirements</p> <p>2.4.1. Chipboard: description, basic production principles, raw materials</p> <p>2.4.2. Storage of raw materials</p> <p>2.4.3. Hydrothermal treatment of wood</p> <p>2.4.3. Stripping and peeling of wood</p> <p>2.4.4. Wood processing in chips and sawdust</p> <p>2.4.5. Storing chips and sawdust between the operations</p> <p>2.4.6. Transportation, drying and sorting of chips and sawdust</p> <p>2.4.7. Dispensing chips, sawdust and glue and mixing them together</p> <p>2.4.8. Shaping and pressing</p> <p>2.4.9. Pressing Making the cyclogramm and pressing</p>				
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	2.5. Wood in construction	2.5.1. Classification of wooden buildings by design		Describe and recognise the most common wooden building constructions, their features, advantages and disadvantages.	The students get acquainted with the most common types of wooden building constructions and discuss their peculiarities, advantages and disadvantages.	
		2.5.2. Classification of wood materials in construction		Name and recognize the materials used in the most common wooden constructions. Describe their usability, advantages and disadvantages. Recognize and name their quality requirements and specifics.	The students get acquainted with the most common materials used in wooden building constructions and study their usage, advantages and disadvantages.	
		2.5.3. Production of wood composite materials for construction		Name and recognize the most common wood composite materials. Describe their production process and structure; identify the most characteristic defects and their causes.	The students learn the most common wood composite materials, their construction and the general manufacturing process and defects that may occur during the production.	



		2.5.4. Classification of most common joints in wooden constructions		Name and recognize the most common joints. Understand their properties, markings and strength classes.	The students become familiar with the most common joints, their properties, marking and strength classes.	
		2.5.5. Most common joints in wooden construction		Name, recognize and theoretically select the most appropriate joints for different examples of constructions under different operating conditions.	The students get acquainted with the manufacturers' and regulatory enactments and recommendations for the proper use of various joints.	
		2.5.6. Requirements for most common joints in wooden constructions		Correctly identify specific types and conditions for coupling devices. Be able to design the most common wooden building joints.	The students get acquainted with the conditions and recommendations from manufacturers and regulatory enactments regarding the proper installation and placement of various wooden joints. Discuss the examples of various joints.	
		2.5.7. Constructive protection of wooden constructions against weather		Understand the meaning, basics, action, advantages and disadvantages of wood constructive protection. Be able to choose and properly address the most appropriate constructive solutions for passive protection of wooden structures.	The students learn more about the basic principles of wooden constructions passive protection. Discuss various constructive solutions for protecting structures against weather.	
		2.5.8. Chemical protection of wooden constructions against weather		Understands the principles and action of wood chemical protection, and its advantages and disadvantages. Is able to choose and apply the most appropriate wooden chemical protection solutions for wooden constructions.	The students learn about the basic principles of wooden constructions chemical protection. Discuss various constructive solutions for protecting structures against weather. Also discuss the regulations regarding the topic.	
		2.5.9. Compatibility and connection of wooden constructions with other materials		Understand the compatibility and connectivity of wood and other materials. Understand their positive and negative qualities, risks involved and potential benefits. Be able to make well-founded decisions on possible solutions in different constructions.	The students study the most common materials used in the construction together with the wood; discuss different examples of good and bad practices; get to know the potential chemical and physical processes that can occur when combining treated or untreated wood with other materials.	



	<p>2.6. Processing of wood by-products</p>					
<p>Is able to: ensure the quality of the product; ensure the quality of the production process and recognize and eliminate the risks of quality mismatch. Knows: product quality requirements at different stages of the production process; causes of manufacturing defects and ways to prevent them. Understands: the relationship between production technology, equipment and instrumentation (technical condition, specifications, maintenance) and its impact on the production quality.</p>	<p>3.1. Quality control system</p>	<p>3.1.1. Quality control systems: essence and importance</p> <p>3.1.2. Quality control systems</p> <ul style="list-style-type: none"> • LVS EN ISO 9001:2017 • LEAN (5-S) • Comprehensive quality management <p>3.1.2. The essence of the approach to the process</p> <p>3.1.3. Typical basic processes at various woodworking companies</p> <p>3.1.4. Measuring the process</p>		<p>Describe the quality control system essence and meaning, define quality</p> <p>Describes the principle of quality management system and its continuous improvement</p> <p>Describe ISO 9001:2017 basic principles and major requirements</p> <p>Describe the basic principles and requirements of LEAN (5 S) system</p> <p>Describe the general principles and requirements of quality management</p> <p>Describe the essence of the process approach and its implementation in the company. Tell about the activities for effective process approach.</p> <p>Describe the processes in the company.</p> <p>Describes the process measurement parameters, criteria, frequency and type.</p>	<p>The students meet the description of the quality management system and its benefits for companies.</p> <p>The students learn about the basic principles of quality management systems and examples of its continuous improvement.</p> <p>The students study the basic principles and requirements of ISO 9001:2017, and analyse its advantages and disadvantages.</p> <p>The students learn about the basic principles of LEAN (5 S) system and analyse its advantages and disadvantages</p> <p>The students study the basic requirements of comprehensive quality management, analyse its advantages and disadvantages and determine the main differences between ISO 9001:2017</p> <p>Students study the essence of the process approach and the conditions for an effective process approach.</p> <p>The students learn about the basic processes and their identification in a woodworking company. Identify such processes and its flow in their company.</p>	



		<p>3.1.5. Implementation of the quality management system: the main stages</p> <p>3.1.6. Implementation of quality control system: typical problems</p> <p>3.1.7. How the partners' requirements impact the quality management system</p>		<p>Describe the major stages of quality system implementation.</p> <p>Describe the challenges in quality system implementation.</p> <p>Describe how the partners' requirements are identified and how they impact on the quality management system</p>	<p>The students learn about the methods of measuring the processes. By taking examples from their company, they compile process measurement parameters, criteria and frequency.</p> <p>The students get acquainted with the main stages of the implementation of the quality system and determine the implementation stages in their company.</p> <p>The students get acquainted with practical difficulties encountered during the implementation of the quality system; determine the difficulties of implementation of the quality system and the possibilities of its reduction in the company.</p> <p>The students learn the methods of identifying partners' requirements and the impact of these requirements on the quality management system.</p>	
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