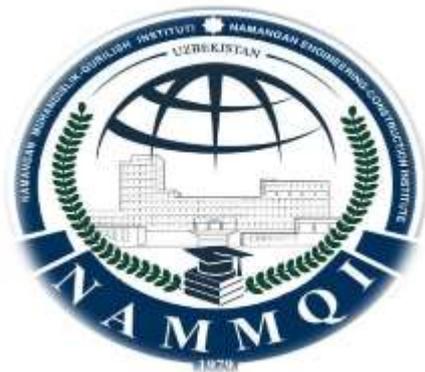


**REPUBLIC OF UZBEKISTAN MINISTRY OF HIGHER AND
SECONDARY SPECIAL EDUCATION NAMANGAN INSTITUTE
OF ENGINEERING AND CONSTRUCTION**



**ON THE SUBJECT OF NONMETALLIC MATERIALS USED IN
VEHICLES**

**EDUCATIONAL METHODOLOGICAL
COMPLEX**



Namangan 2022

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DEPARTMENT OF "VEHICLE ENGINEERING"

G.F.Valiyeva, A.SH.Nasriddinov

NONMETALLIC MATERIALS USED IN VEHICLES

Namangan – 2022

Nonmetallic materials used in vehicles educational and methodological complex on the subject 60712500-designed for students of the directions of engineering of vehicles.

Developer: PhD. G.Valiyeva
PhD. A.Nasriddinov

Reviewer: DsC. R.Solliyev

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Introduction

Our country has acquired its own automotive industry after achieving independence. Currently, the creation of joint enterprises "GM Uzbekistan Auto" in Asaka and "ISUZU", "MAN" in Samarkand has increased the demand for modern lightweight, cargo and bus production in the city of Asaka, durable and BICR structural materials.

The use of modern structural materials has laid the foundation for a significant rise in the quality of manufactured cars and the safety of movement.

A new generation of structural materials was first produced in the United States of America. Initially, such materials were used in flying machines. A new generation of structural materials called composite material, the creation of which has qualitatively elevated the field of materials science.

The use of composite materials in the automotive industry has made it possible to increase the service life of vehicles in av reliability, to reduce their fuel consumption due to reduced weight, and to effectively use the power of their Iodes. The bhlgan need for compositing materials is so rapidly that millions of tons of products are being produced to meet this need.

Some of such materials are glassplastics and many other composites obtained on the basis of polymer compounds. It is characterized by being extremely thorough due to the improved structure and surface of the crystals. Compared to fiber-reinforced metals, the class of composites is much wider.

Plastics filled with sintered or dispersed phases will have excellent properties: high relative strength, low thermal conductivity and detail, along with chemical stability, and technological aspects in the preparation of structures will be favorable. Selective plastics with the addition of special fillers are used as heat protection for objects of space technology, as well as in structures with a high longitudinal strength.

Glass plastics are typical structural materials in which thermorreactive resins are used as bonding materials, and various fiberglass materials are used as fillers. Glass plastics do not lag behind steel in terms of strength, withstand shock-induced and dynamic nagruzkas well and quench the vibrations of their structural elements. The use of chemically stable glass plastics allows for a much more rational implementation of large-scale technological processes (for example, the production of sulfuric acid, chlorine, mineral Oaks and caustic soda), which are associated with the use of aggressive media at temperatures not higher than 150os. Among these, the most important are multilayer glass plastics.

In their first two layers with a thickness of 2-3 mm, in terms of mass, 10 and 25% glass fiber, respectively, prevents the passage of aggressive liquid into the structural layer (force layer), which will contain 60-65% glass filler, that is, it will

perform the role of a thermal barrier. Glass fiber anisotropic material, obtained by adding a bonding substance (thermorreactive tar) from glass fibers, in which molecules are regulated and arranged in parallel, becomes extremely robust and is used in the construction of large warehouses, pipelines, Trestles and hokozos.

As you know, the limit of metallmas materials with metal materials is conditional. The best Union of metal and non-metallic materials is found in composites: they are formed by attaching them in such a way that there is a clear boundary of separation of raw materials of different sexes. The combination of substances of different sexes in the composition gives a great effect: it looks as if a new material is being created, which differs from the properties of each in the properties and in the components that make up it quantitatively. Usually the composite material is composed of a filler with a plastic base (Matrix) - powder, fiber shavings or particles of any other shape. The joints ensure the thoroughness and hardness of the composition, and the bonding materials ensure the adhesion between the constituent components, thorough and plastic when the force is exerted. In some cases, the bonding material protects the filler from the aggressive effects of the environment. The properties of composites are determined not only by their composition, but also by the mutual arrangement of different phases and the thoroughness of the bonds at the additive – base boundary of the particle sizes.

A high consistency was achieved by grinding composite materials. High-strength meticulous composite materials began to be produced in 1940. From the 50s of the XX century, meticulous composite materials reached a level that competed with other structural materials.

As a result of the development of the manufacturing industry of carefully composed materials, it is now widely used in the fields of mechanical engineering, automotive, shipbuilding, aircraft construction and cocmonautics.

REPUBLIC OF UZBEKISTAN

**MINISTRY OF HIGHER AND SECONDARY SPECIAL
EDUCATION NAMANGAN INSTITUTE OF ENGINEERING AND
CONSTRUCTION**



NONMETALLIC MATERIALS USED IN VEHICLES



Lecture text

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Nonmetallic materials used in vehicles the text of the lecture on the subject of the complex is intended for students of the 60712500-vehicle engineering directions.

Developer : PhD. G.Valiyeva.

Reviewer : DsC. R.Soliyev.

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THEORETICAL MATERIALS

Module 1. Chemical materials used in vehicles. Composite material and prospects for their use.

Plan:

1. Composite materials.
2. Prospects for the use of composite materials.

When obtaining composite materials, mainly artificial and natural polymers are used. When obtaining plastics, thermoplastic and thermosetting binders are used.

When producing and preparing a new composite material, as well as when creating structures from them, it is necessary to take into account the area of application of this material. Economical design convenient for composite materials are widely used in practice.

Of the 50 types of plastics currently produced, 36 are thermoplasts (which soften in return and Harden when the temperature changes) and 14 are reactoplasts (which do not soften when heated). The share of thermoplasts in the production of polymers is steadily increasing, and in the coming years it is expected to reach 75%. Thermoplasts can be cast under pressure, molded in vacuum, pressed into certain shapes, or processed and processed by simple molding. Such plastics include polyethylene, polyvinyl chloride, polystyrene plastics.

The composition of plastics applied as materials is usually complex and consists of at least three groups of substances: 1) base or matting materials (artificial polymer resins); 2) plasticizers that help the material to move into a pasty state; 3) filler (sawdust, crushed asbestos, glass fiber, graphite), which forms mechanical reinforcement, hardness and thermal stability.

The advantages of plastic materials over metals are their extreme stability in aggressive environments, low density, extremely high resistance to edilation, the goodness of dielectric and thermal insulation properties, the property of absorbing and quenching vibration, the ease of making complex structural details from them. The tendency of many high molecular compounds to wear and tear, including destructiveness, to the process of reduction in the length of chains and the size of macromolecules, is their disadvantage.

Rubber products, which are components of composite materials, are widely applied in all sectors of the people's economy, especially in the auto industry, because rubber, which is considered the main component of rubber, is very elastic and can deform very strongly (up to 1000 percent), but after receiving the load, the rubber almost completely returns to its previous state. In addition, the chemical resistance of the rubber, the resistance to corrosion is high, has good electrical insulating properties, the density is not very high. Modern cars have several hundred different rubber details. 60% of the rubber produced is spent on the production of tires for autotransport techniques. The total mass of rubber materials spent on cars is 8-9% of

the mass of the car, at the same time the total cost of the car is 10-40%, from which it seems that rubber is a valuable and rare material.

The varnish-paint coating, which makes cars look presentable and protects details from corrosion, also occupies an important place in the automotive industry's sonoot. More than 85 percent of cars, rural equipment and various technological equipment are painted with varnish paints. In addition, painted items have the same electrical insulation and heat preservation properties as bhladi.

The formed layers must meet the requirements for them and meet the requirements of the DAST for long-term operation. Varnish-paint materials are made of KHP laminated coating in khplik cases for quality resistant bhlishi.

It is necessary to understand well what kind of product or product should be produced from each polymer and the demand for this product. In order to obtain polymer-based Plastics, Rubber Products, Varnishghbhyoq materials and fibers, it is necessary to be able to select thgri raw materials in processing, and for this to know well the properties, structure of polymers and changes in the process of their processing.

The "struggle" between metal materials and plastic materials can be very clearly traced on the example of how to make a car out of plastic, which is often shown in the press. In addition to metal savings, it would be possible to save fuel only a little when it is done. on the way to the introduction of polymeric materials into the production of a gross car, there are also various dividing points. One of them is a purely psychological barrier. The second is that the plastics in use do not tolerate too much time. As is known, the properties of most polymers deteriorate only after 10-15 years. But in later times, the situation changed somewhat, since in the near future cars would serve their owner for 20 years or more, and now, when it comes to the period of gross carization, this period has decreased significantly. This circumstance is explained by the fact that an advertising company, promoting the advantages of a new model, has thoughts of increasing prestige and spiritual wear of vehicles. Finally, the third obstacle on the way to the use of plastics is the unwritten rule-the more expensive the material, the better it is, with the rule of Duty. For the first time in the world there was a lightweight car "Trabant" (Germany) with a large number of manufactured plastic bodies. Its body was made of pressed fibrous multi-layer cotton mass, along with powdered phenol and crezolformal'degid tar at high pressure and appropriate temperature. The car, made entirely of plastic, was made by the firm "Baer" (Germany) for its practical purposes. It is made of solid polyurethane penoplast, which is primed with glass fiber, covered with a layer of epoxy resin. Materials obtained on the basis of polyurethane penoplasts are those that meet the requirements for automotive materials.

The use of modern composite materials in the development of the automotive industry serves, on the one hand, to increase the service life, reliability of cars, to reduce their cost, and on the other, to increase their competitiveness in the domestic and foreign markets.

Control questions

1. Goals and objectives of science.
2. Modern composite materials.

3. Promising composite materials.
4. The development of chemical materials used in automobiles.

Module 2. Tar applied in vehicles.

Plan:

1. Properties of polyhedral resins and the product and details obtained from them.
2. Resins based on complex diefirs of vinylcarbonic acid and their properties.
3. The properties of polybutadiene resins, the product and details from which they are obtained.
4. Properties of epoxy resins and their areas of application.

Properties of polyhedral resins and the product and details obtained from them. At the beginning of the 20th century, materials obtained on the basis of tar began to be used in industry, including in the field of technology. In the 30s of the last century, the American scientist K.Ellis proposed the idea of producing an insoluble solid material based on unsaturated polyhedral resins. In this case, it was proposed to add a perekis initiator to the polyhedral Tar. It was later discovered by Ellis that monomers such as vinylacetate or styrene can be produced as a result of adding more valuable materials to unsaturated polyhedral Tar. Adding manomers to tar reduces their viscosity. This will make it easier to mix different initiators into the diluted Tar.

Polyunsaturated polyhedral resins have different properties. Liquid tar at room temperature may not solidify for a long time (several months, or even several years). But, when a perekisli initiator is added to it, it goes into a solid state within a few minutes. In this, it does not diverge in any output. Heat is released when the Tar moves to a solid state.

Polyhedral tar is used in the manufacture of various items, including building panels, details of cars and aircraft, etc. In the manufacture of such items, mainly selective filler polyephile tar is used. And Unbreakable tar is used in the manufacture of various buttons, Su'ny mramir, body putty and other items.

There are the following types of unsaturated polyhedral resins: general-purpose polyhedral resins; elastic polyhedral resins; BICR polyhedral resins; low-sedimentary polyhedral resins; atmospheric-impact-resistant polyhedral tars; chemical-resistant polyhedral tars; heat-resistant polyhedral tars.

Polyhedral resins, which are used for general purposes, are used in the manufacture of paddons, containers for storing water, details for systems applied with liquid. Resin with elastic polyhedra is more often used in the manufacture of furniture, various buttons, molds for opening rez ba on wood materials. Products that are resistant to the impact of impact on the tattoo from BIKR polyhedral tar are produced: protective masks (helmets), details of cars and aircraft. Low-sedimentary polyhedral tar is used in the preparation of details of cars and electrical equipment. Coatings, external panels are produced from resins that are resistant to atmospheric influences. From resins resistant to chemical influences, capacities, tubes and other details are produced that are used in alkaline and acidic environments. Heat-resistant tar is used in the preparation of electrical equipment details, panels, hulls of Warships.

Resins based on complex diefirs of vinylcarbonic acid. Tar based on complex diefirs of vinylcarbonic acid is a thermorreactive polymer. Such tar is also used neat (that is, without additives) and in the case of a mixture with other ingredients. Although the first Vkmds were obtained in laboratory conditions in the 50s of the last century, only in 1965 the production of tar of the initial brand "epochril tar" was established by the firm "Shell kemikal". The chemical stagnation of these resins is much higher, which in this aspect has good properties even from the highest quality polyhedral resins. In 1966, Tar of the Derakan brand was produced by the firm "Dau kemikal" and these tar was used to form coatings. Since 1977, Vkmds named "Koretsin" and "Korrolit" began to be produced by the firms "Interpastic" and "Reichhold", respectively.

Currently, based on the technology of firms named above, Vkmds are produced in such brands as Epocril-12, Epocril-370, Koretsin VE-8100, Koretsin VE-8300, Derakan 411-S-50, Derakan 510a40, Korrolit 31-345.

Vkmds can be used at temperatures of 90-1500s. The strength limit in stretching them is 75-85 MPa, the strength limit in twisting is 120-135 MPa.

The main part of the manufactured Vkmds is used in the production of pipes and capacities that are resistant to chemical influences.

Palibutadiene Tar. Polybutadiene tar is a thermorreactive tar with a high molecular hydrocarbon content. Their electrical properties are at a high level, have good resistance to chemical influences, are sufficiently resistant to thermal influences, absorb moisture little, and the initiators are involved, which quickly solidifies. This level of goodness of the properties of polybutadiene resins allows them to be used for a wide variety of purposes. Polybutadiene resins are mainly used in the preparation of coatings, adhesives and electroisolating compounds.

In 1955, a polybutadiene Tar named "Buton" was produced. In the next year, such resins as "Nisso-RV", "Dienite", "Ricon" are produced.

Properties of epoxy resins and their areas of application. Epoxy resins are synthetic resins with an epoxy group in their macromolecule. It is formed from the interaction of epichlorhydrin with phenols, amines and other substances. Epoxy resins are resistant to the action of alkalis, washers, oxidants and most inorganic acids, have high strength, good electroisolation properties, low penetration, good adhesion. Epoxy resins are one of the best binding materials for most fiber composites. In the manufacture of various composite materials and structural details, epoxy resins are widely used. They are also used in the preparation of hermetic compasses, press powders and adhesives.

When restoring details at repair enterprises, epoxy resins are often used. They can be stored for a long time at room temperature. A hardener (when it is added, the polymer hardens) and substances that give plastic properties (plasticizers) are added to the liquid tar. Decoctions are prepared from 150-200 g. They should be used and sent within 20-30 minutes after preparation. Epoxy resins differ from each other in their molecular structure, mass, and the compositions prepared on their basis differ in the type and quantity of fillers.

Filler-free compositions can be used to attach well-matched metal surfaces to each other. If it is necessary to repair cracks in cast iron or steel products, iron

powder or epoxy tar with the addition of cement should be used as a filler. When repairing aluminum details, tar with aluminum filler is used. It is also possible to repair them in a cold state without heating them, but in order for the composition to fill the cracked well and get attached to it, it is recommended to heat the detail to 60-80°C before applying Tar. To achieve a high consistency, it is necessary to carry out repairs at high temperatures. After the repaired place has dried, it is subjected to mechanical processing.

In field conditions, a set of materials and tools for repair (apothecaries) was produced on the basis of epoxy Tar. To prepare a small amount (1-5 g) of the composition, Tar laid out in jars can be used. In the kit there will be two such containers, one will contain tar, a plasticizer and a filler, and in the other-a stiffener.

Table 1.1. Epoxy compositions and their use

Components (by weight)				Area of application
Epoxide Tar	Plasticizer	Stiffener	Complement	
100	20	10...11	Crushed Mica-30, cast iron	Cylinder block golovka (cracked, perforated areas, corroded areas around the water sheath hole), dviga-wire crankcase poddo (cracked areas), cracked and perforated areas in the gearbox, eating areas of the transfer surfaces (bearing-corpusval, axle-casing, bushing-casing) up to a notch greater than 0.1 mm
100	15	10	Powder-50	
100	15	10	Cast iron powder-50	
100	15	10	Hence itself	
100	25	10..12	Crushed Mica-20, iron oxide-150, crushed mica-20	
100	15	10	Aluminum powder-25	Cracked and perforated areas on the walls of oil and water radiator tanks; capped areas of Tanks; cracked areas on the walls of fuel tanks, perforated areas; corrosion-blown places
100	25	11	Aluminum powder-7-10	
100	20	10	Crushed Mica-40	
100	25	11...12	Crushed Mica-100-150	
100	20... 25	11...12	Crushed Mica-100-80	
100	10...20	10	Aluminum powder - 7-10	Spire kakorpus junctions - formed a notch of at most 0.03 mm - Cha eaten areas, to a notch larger than 0.1 mm of the transfer surfaces (pod-shipnik-Hull-shaft, axle-Hull, bushing-Hull) - Cha eaten areas
100	20...15	11		

When repairing cracked and porous in details (radiators, fuel tanks, body panels) made of thin strips, the contents are applied to the surface with a thickness of 1.5-2 mm or a glass tissue is glued.

The edges of the layer should not protrude and have no thickened areas.

The most common defects include tailors in the engine block and head. One of the most common ways to restore them is to fill the cracked with epoxy Tar. In this case, cement or marshallite is used as a filler. The ends of the seam are drilled (the diameter of the hole is about 3 mm), after which a groove 6-8 mm wide is carved in the place where the seam is left. The depth of the ditch should not exceed half the wall thickness, the Arion and the surface touching it are improved and cleaned, degreased with acetone or other solvent, and the content is poured so that 2-3 mm protruding rollers are formed from the surface.

Paper is glued to the bottom side of the cracked, which is also passed to the back of the wall. Wide perforated areas are covered with reinforced epoxy resin: in this case, the composition is first applied, then a patch is placed from the gaslama and tar is applied again over it (the patch should be glued to the slightly dried tar in such a way that there are free areas left on the cleaned side).

When repairing cracks and burn defects in the engine piston, first a thin layer of filler-free polymer is applied to the surface, and then the main composition. The piston is dried at room temperature for a day, after which the restored area is treated with the help of sand paper or egov.

Perforated areas are covered with glass textures or metal overlays. If the surface of the detail is complex, it is advisable to drill holes along the contour of the hole. A net is made of purified soft wire, a glass tissue is laid in it in several layers.

To form hermetic compounds (especially in fuel tanks), the point welding process is performed along with the epoxy resin filling into the metal lists seam. glue bolted and glue parchin nail compounds are created. In this case, low seams are made to increase the consistency and hermeticity.

Control questions.

1. What are the properties of tar based on complex diefirs of vinylcarbonic acid.
2. What properties do polybutadiene Tar have.
3. What properties do epoxide Tar have.
4. In what areas are epoxy resins used.

Module 3. Plastics used in vehicles

Plan:

1. General information about plastics.
2. The main types of thermoplasts and their properties.
3. The main types of reactoplasts and their properties.
4. Technology for obtaining an object from thermoplasts.
5. Technology for obtaining an object from reactoplasts.

General information about plastics. Today it is difficult to imagine the construction of vehicles and cars without plastic materials. The use of these materials made it possible to compact the structures of technical means, reduce their mass, increase reliability, as well as reduce the cost of production and labor costs. The wide

puddle of plastics is caused by the fact that they can directly replace precious metal and wood materials, in most cases surpassing them in their properties.

Plastics are high molecular compounds that are obtained on the basis of natural or artificial Tar. Plastics under the action of heating and pressure, plastic can deform and take a certain shape, keeping this shape stable. The production of plastics is increasing regularly, and the areas of their use are expanding.

It is difficult to imagine the construction of cars without polymer material. Their use is also beneficial economically, chunonchi, the cost of materials, the labor consumption of detail preparation are reduced, the details are much lighter, capital expenditure and operational spending (on lubrication, repair) are reduced, etc. When making products from plastic, the waste of materials does not exceed 5-10%, and when making from metals, the waste is much more (60-70%). Products from plastic will be two to three times cheaper than those made of metal. Plastics have a complex composition. Their main part is made up of binding agents, which consist of natural or artificial Tar (polymers). They are substances composed of chemically bound zvenos whose molecules are returned several times. The plasticity, that is, the fact that it takes the desired shape and retains it, is a characteristic property of polymers. In some polymer compounds, the adjacent guruppas of atoms will be connected in a BICR carcass way. Such materials will not be soluble. In addition to the binding substance, the composition of the plastic also includes:

Fillers (wood flour, soot, glass fluff, paper, asbestos, aerating, metal powder, etc.). Fillers are designed to reduce the consumption of an expensive binding substance, as well as increase the strength of the item, reduce its penetration. While asbestos fibers increase the heat resistance of materials, metal powders or graphite give it Electrical and heat transfer properties;

Plasticizers (derivatives of oils, phosphorous and phthalic acids); they make polymers plastic and easy to process;

Antioxidants-substances that increase the resistance of plastics to the effects of oxygen, sunlight in the air;

Dyes, oils, pore-forming agents and some other substances.

The properties of plastics depend on the composition and amount of substances added to them. By changing the amount of these substances, it is possible to obtain compounds of different, even predetermined properties. The water resistance of most plastics, the ability to resist the effects of many aggressive substances and petroleum products are their most important positive properties. Chemical achievements allow you to get plastics that can work both at low temperatures and at high temperatures. Since most plastics are good electrical insulators (dielectrics), they can be used in the preparation of electrical equipment of cars and tractors. The fact that it is not so resistant to heat, as well as changing its properties over time, that is, the tendency to wear out, is a disadvantage of plastic. But materials that are free from these shortcomings are being created more and more rudely.

The areas of application of plastics in the automobile transport economy and their advantages are as follows:

- frictional details (overlays of clutch discs, brake tapes, pads, etc.)

- large and stable friction coefficient is ensured, the wear resistance is increased;
- antifriction details (slip bearings) - the friction coefficient is reduced, the wear resistance is reduced, the service protection costs are increased, the noise is reduced;
- low and medium pressure pipe system (fuel, oil pipes, cooling systems, etc.)
- not corroded, non-ferrous metals are not used;
- the service life of gaskets and conduits (instead of non-ferrous metals and probes) is extended, and the efficiency of work is increased;
- large gabarite structural details (cabin roof, buck, wing, bonnet and Kater elements) - less metal is spent on machines and their mass is reduced, corrosion is reduced, service life is extended, working conditions are improved.

Plastics are divided into two main large groups: thermoplastic and thermorreactive plastics. Plastics that soften when heated and become very plastic, deform easily, and solidify again when cooled, are called thermoplastic plastics. Many times such material can be transferred from one state to another. They dissolve in various solvents. Details made from these polymers can work at a temperature not too high (up to 60-70 OS), and some withstand up to 160-200 Os.

When heated, plastics that first sum up and partially liquefy, and then move into a non-liquefied and insoluble state, are called thermorreactive plastics. They do not dissolve in solvents or swell slightly. The processing of thermorreactive plastics is a irreversible process.

According to its function, plastics are classified as:

- Structural Plastics - decorative-machined, with high, medium and low strength, resistant to heat and cold effects;
- electrical and Radio-Technical Plastics - electroisolating, electrically conductive;
- amartizing, sound and heat-insulating;
- frictional and antifriction;
- resistant to anticorrosion and aggressive environmental influences (to the effects of the atmosphere, acid, alkali, petroleum products, solvents, etc.).

Most plastics will have coppex properties that can be used in several areas. For example, polypropylene is used in the manufacture of complex shaped details, gear wheels, lubrication and cooling system filters, probes, electrical equipment. And polyvinyl chloride - used for various purposes, in the manufacture of tubes, jars of accumulators, details of pumps and fans, seat materials, gaskets.

The main types of thermoplastic plastics. Polyethylene is widely used in many sectors of the national economy. It is made of various films, pipes, vents, details pumps, philoteric housing insulation of wires and cables, so that it is used as a coating to protect metal surfaces from corrosion. The polymer's molecules have a linear structure with side branches. Depending on the conditions under which the process takes place, there will be high, medium and low pressure polyethylene. Medium to low pressure polyethylene has the highest density and differs from other polymers in its higher mechanical properties (break resistance

and moisture resistance). The tendency to wear is a big drawback of polyethylene. In order to slow down this process, 2-3 percent soot is often added to it.

The resistance of polyethylene to heat is not very high, it can be used for a long time at temperatures not higher than 60-80 oS. At low temperatures (at about -70 oS), polyethylene becomes brittle. The Material is resistant to the action of most organic solutions, but swells in petroleum products. It has good electrical insulating properties, is resistant to the action of most acids and alkalis at room temperature, practically does not absorb moisture. Polyethylene films transmit ultraviolet rays. But it does not pass water.

When repairing cars and tractors, polyethylene is widely used in the form of various products, as well as films. Polyethylene powder is sprayed onto the metal surface using a gas flame, with the help of a slurry, vibration and other methods.

Polypropylene is obtained by polymerizing propylene gas. It has a high heat resistance to polyethylene and can work at temperatures up to 150os, is quite elastic and resistant to chemical influences. Used in the preparation of pipes, structural details of Cars, films. Its dielectric properties are approximately similar to that of polyethylene, with almost no binding to the humidity of the medium so used in the preparation of details of electrical equipment.

By the method of pouring under pressure from polyethylene, it is possible to make large surface details such as car and tractor tanks intended for all liquids, air pipes of the body heating system, tubular apparatus, fan parracks and covers, filutrs. For the first time, the fuel tank of the car was made of polypropylene. This will save thousands to thousands of tons of lead steel rods in the future and extend their service life.

Polystyrene is obtained by polymerizing styrene. It is released in the form of list, sterjen powder. Its dielectric properties are very high, water-resistant, transparent well painted, easy to process, chemically resistant to the action of acids (including plavic acids) and alkalis. The disadvantages of polystyrene include the fact that it is not very resistant to heat (can work at temperatures up to 80 oS) and the effects of gasoline, as well as its flammability, cracking and tendency to wear. Two different brands of polystyrene are produced, designed for electrical insulating products, as well as for technical purposes and for a wide range of consumer products (battery jars, glass).

The properties (elasticity, resistance to heat, exposure to petroleum products) of modified MSN, MS-2, MS-3 polystyrene, which were used in the production of umbrellas, color light signals, podfarniks, etc., have been improved. By adding 10-15% synthetic rubber, shock-resistant polytristols are obtained. From them, body details, chemical materials and containers for pumping water are made. Polystyrene is also used for electrical, thermal and noise insulation.

Fluoroplasts are polymers that are obtained on the basis of the fluoride derivative of ethylene. They have high heat resistance and chemical resistance, good antifriction and electrical insulation properties. In the molecules of these plastics, hydrogen atoms are bound to fluorine, not carbon. Tubes, compaction gaskets, cuffs, electrical equipment details, antifriction coatings of vclades,

bearings, protective films are made from fluoroplasts. These polymers are of two types: fluoroplast-3, fluoroplast-4 brands are released.

Fluoroplast - 4 is a fiber-soft powder that can be used to obtain dense tablets from it by pressing. These tablets turn into a white mass with a slippery surface at 360-380 oS. Among the materials known to us, the most chemically resistant, it is not affected by solvents, acids, alkalis and oxidants. It is practically not chemically eroded. It is considered one of the best electrical insulators. It can work for a long time at low temperature (up to 120 oS). It has the property of self-lubrication, its coefficient of friction is about 0.04. It is a promising material used in the preparation of gliding bearings, bushings and other friction surfaces.

By adding graphite and molybdenum disulfide to fluoroplast-4, a self-lubricating antifriction material AFGM is obtained. This material is removed in the casing of cylindrical zagotovkas with a diameter of 60-600 mm for the preparation of slip bearings, compressors compressive and directional rings. At high temperatures, toxic fluorine can be released from the fluoroplast. The tendency to erode at high specific loads and speeds is a major drawback of this polymer.

Although fluoroplast-3 is quite elastic, but its electrical insulation properties, heat resistance and chemical strength are somewhat lower. Can work at temperatures from -150 to +70oS. Considered a modified polymer, fluoroplast-3M can work at a temperature of 150-170oS. These materials are mainly used in the form of 30-60 percent water or alcohol suspensions: they are designed to form antifriction and electrical insulation coatings, as well as varnish glass tissue.

Polyacrylates are a group of highly transparent and crack-resistant plastics. Polyacrylate glass is produced in the form of lists with a thickness of 0.8-24 mm. It is twice as light as ordinary mineral glass, transfers ultraviolet rays by up to 75 percent (mineral bottles hardly pass them). The technical consistency and gilding viscosity of organic glass are high (does not break), resistant to the effects of water, acid and solvents. The glass is not too hard, it scratches easily and loses its transparency. At a temperature of 80oS, polyacrylates begin to soften, at a temperature above 105oS they become plastic, and details of various shapes can be obtained from it. In order to increase the strength and heat resistance of the surface, styrene is added to organic glass (MS, MS-2, MS-3 brand organic glass), multilayer bottles (triplex) are used, glued together with a thin transparent curtain. They are used when installing Windows on cars, in the preparation of transparent details of pribors. When repairing a car and tractor, self-hardening plastics are used, which are obtained on the basis of an organic window with the addition of a stiffener and paints.

Polyvinyl chloride is a pale plastic material from light brown to dark brown. Its electrical insulation properties are good, its chemical resistance is high, it does not dissolve in petroleum products and alcohols, it does not burn. Being a hard and elastic material, it is easy to process (it can be stamping, drilling, milling, polishing, giving it a pattern, gluing, welding). It is produced in the form of plasticine and lists, flies, tubes, shaped objects and powder up to 20 mm thick. Swelling in water as well as the limited frost resistance (up to-20oS) is a

disadvantage of this plastic material. It is able to work at a temperature of up to 150-160 °C, at a temperature of more than that, turning dark brown in color, secreting hydrogen chloride from itself. It can decompose under the influence of sunlight.

Polyvinyl chloride is used to make battery jars, details of pumps, fans, water, fuel, oil pipes, containers (for example, a window washer tank that blocks the wind), moldings seat covers, which are used to cover the body, etc. Film-based materials obtained on the basis of Vinplast are used for wire insulation and engine conservation.

Polyamides (polymers of linear structure) are common plastic materials, which include Capron, nylon some other materials. They are hard-shockproof, edible polymers, liquefy at a temperature of 150-220°C, decompose at about 300 °C. Resistant to the action of alkalis, petroleum products, not resistant to the action of mineral and organic acids. Loses consistency (wears out) when exposed to the atmosphere in the long term. The coefficient of friction of polyamides is smaller than 0.05, so items with self-lubricating properties can be made from them. They can be used both in non-lubricated areas and in areas that are lubricated with water and oil. The antifriction properties of polyamides with the addition of graphite, molybdenum disulphide, taluk and others are good and have a high resistance to eating.

From polyamides, bearings, bushings, gaskets, gear wheels and other details of cars and tractors are made. They have a number of advantages over metal details. Capron bushing, for example, is three times cheaper than cast iron bushing, but serves more than ten times. Capron details can work even at a temperature of 100 °C. Also from polyamides are made details of the carburetor, door locks, fan fenders, the body of air filters, rollers and other details of the roughness that fall into the mechanical nagrosis, including the vclades of the spherical finger of the roller shutter.

Finely dispersed powdery polyamides: Capron, P-65, P-A-K7 (A and B) are released. Powders can be used not only in the preparation of products, but also as an insulating, antifriction-resistant coating on the rubbing surfaces of metals. P-68g filled with talus of polyamides, P-68DM filled with graphite, K-G-70 (kapron) stamps filled with graphite are issued. Details of the engines that can operate at temperatures up to 160 °C are made of reinforced (reinforced with frames made of metal or glass fiber) polyamides.

Technical methods for processing plastics include: casting under pressure, extrusion, calandring, mixing pigments into polymers, modification of the surface of the polymer film, etc.

The concept of calandring. Calandring is a process that consists of obtaining a continuous polymer material. To do this, the polymer is softened and passed through the rotating calander shafts. In the kalandring method, materials in the form of a wrapper and a list are obtained. This method is used only in thermoplastic polymer materials. When calandring, the softened polymer is passed through each pair of Shaft intervals once. In the process, the width of the strip or canvas being taken will

increase, as well as become thinner. As a result of calandring, a Chamber of the specified value is obtained in width and thickness.

The calandring process is carried out on machines called calandres, consisting of three or more hollow shafts.

The calander is well processed into the shafts of the machine, which are often located one above the other in a horizontal position. Shafts are heated by steam to the softening temperature of polymeric materials.

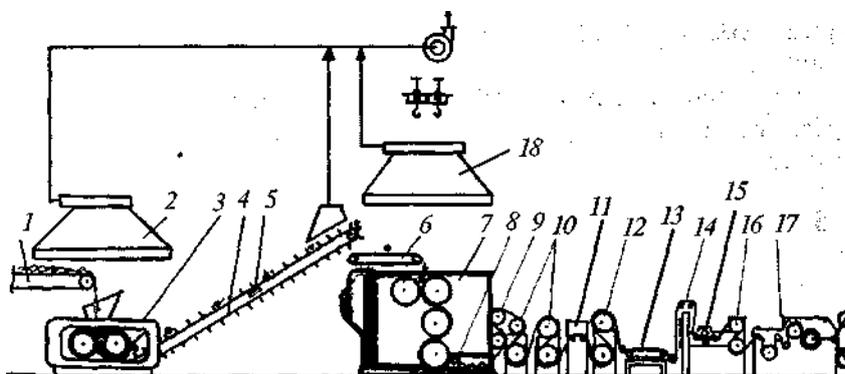


Figure 1. Technological scheme for the production of PVC by the method of calandring

1-transporter for the transfer of plastered mass; 2, 18-local air suction device; 3-Vales; 4-transporter; 5-metal particle Capture Device; 6-mass application device; 7-calander; 8-puller device; 9-forming device for the surface of the film; 10-cooler; 11-film thickness detection device; 12-film Edge shearing device; 13-film clarity detection device; 14-film-transmitter; 16-static electric charge-loss device; 17-device for film wrapping.

As can be seen from the scheme, according to the recipe, the components that are part of the composition initially fall into a continuous (or faceted) working mixer. The resulting mixture is homogenized in waltzes, at a certain temperature, and transmitted through the transporter to the Calandre in the form of a continuous band. In order to maintain the smoothness of the surface of the calandr shafts, a special device is installed in the transporter to detect the presence of metal particles and extract them.

The Material softens by passing between the upper shafts, and when it becomes a chamber, it enters between the middle and lower shafts. The chamber protruding between the shafts is usually attached to a shaft with a high temperature. Since the middle and lower shafts are mounted on the excitable axis, the distance between them can be changed as needed. Figure 1 gives a scheme for obtaining a film in the kalandrash method.

The finished film coming out of the lower shaft of the calander is rolled into special coils, passing into the cooling drum (the cooling temperature is determined depending on whether it can wrap this film). The width of the polotno coming out of the calandr machines will be equal to the length of the shafts.

The uneven edges of the film are sheared using special devices, then the film goes to a special tool - compensator, the task of which is to adjust the connection between the calander speed and the winding coil.

Extrusion. Continuous compression of thermoplastic polymers through holes with different profiles and its cooling is called extrusion. With this method, pipes, curtains, list, film, hoses, polymers for overlaying cable wires and various items measured lengthwise are obtained.

The extrusion process is carried out on machines called extruders (fig. Extruders are different: one chervyakli, two cher-vyakli, disc and combined.

The extruder mainly consists of the following parts: stanina, in which a heated cylinder is placed; a cylinder, one or two chervyaks are installed on its inside, -chervyaks are connected to an electric motor; the cylinder has a heating and cooling system.

For shaping, a special mold is used. For example, to obtain a pipe, an additional equipment is made, which gives a profile consisting of a mundshtuk and a Dorn.

The material for extrusion falls into the heated cylinder through the machine Hopper in the granule state. From there, the hot material that has passed into a flowing state is pushed forward by the rotating Auger tool and squeezed through the mold installed in the head part of the machine.

Hence, the task of the extruder is to move the polymer along the cylinder, ensuring its softening and transition to homogenization, in addition to creating hydrostatic pressure inside the cylinder. The pressure serves to allow the polymer to flow and transform it into shape through the head.

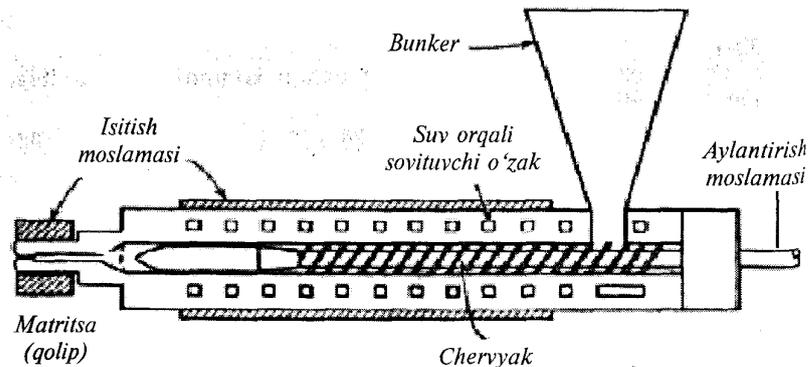


Figure 2. Extruder scheme

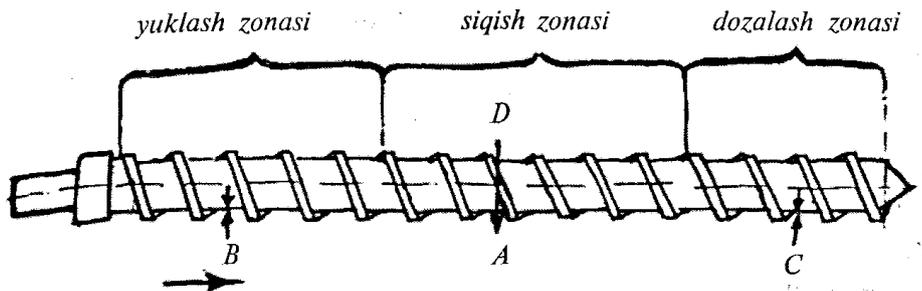


Figure 3. Division of chervyak into zones

The heated cylinder, like chervyak, is conditionally divided into three zones (fig.

Zone 1 is the zone where the granule falls into the cylinder and moves it forward and condenses.

Zone 2-compression zone, in this zone the polymer slowly softens and plasticizes under the influence of heat. As a result of the heat and internal friction of the material being given by the process. it is realized due to the heat generated.

When polymers liquefy, their volume decreases, due to which it is planned that the depth of the chervyak channel in this zone will decrease.

The last Zone 3 is the so-called rationing. In doing so, there will be a liquefied polymer along the entire chervyak-screw channel, and this liquefaction is given by squeezing it into the mold.

Technological parametria of extrusion. These include: the temperature of the liquefaction in the cylinder and in the head; the pressure of the liquefaction in the head, the speed (frequency) of rotation of the Schneck.

When determining the Optimal mode, it is necessary to take into account the type of thermoplast, its molecular mass, composition composition, size and shape of the item, the types of equipment used, etc.

For the manufacture of pipes and hoses, ring-shaped straight-flow heads are used. Its structure is shown in Figure

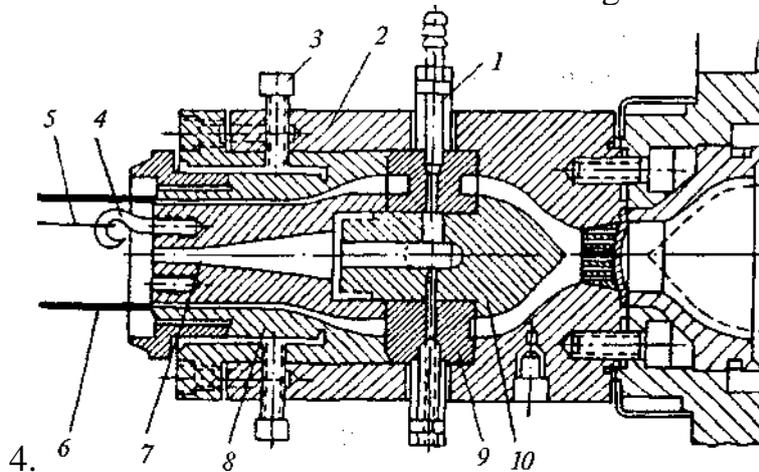


Figure 4. Ring-shaped straight-flow head scheme

1 - nozzle for the introduction of compressed air; 2-housing; 3-adjusting screws; 4-reinforcement device; 5-tross for holding a sliding stopper (in a calibration device); 6-pipe zagotovka; 7-channel for sending compressed air into the pipe; 8-Matrix; 9-Dorn Holding Device; 7-dorn.

When insulating cables, electrical current-conducting wires, the head forming extruders has a different structure, that is, it will be vkladish.

When obtaining items with a complex profile, heads are applied, which can have great resistance to liquefaction.

From the composition prepared on the basis of polyvinyl chloride, rigid pipes are made using a two-Auger extruder. It is also said that the pipes are viniplast pipes. In relation to pojietylene, the extrusion temperature in pipes from PVC Composite also differs in that it is different. It should also be mentioned that

viniplast pipelines are 400 times less heat-permeable than that of conventional steel pipes. That is why water droplets do not form on the outer walls of such a piping.

If the pipes from polyethylene can be held in a viscous-flowing state protruding from the extruder by more than 200°C, then for pipes from PVC it should not exceed 170-180°C, since the thermal stability of PVC is much lower than that of poly-ethylene.

When obtaining pipes from polyethylene and polypropylene (especially those that are applied to external tapering networks), light stabilizers - soot are added to the composition (granule) in the amount of 2-2.5%.

Pressure injection technology. The method of pouring under pressure is mainly used when obtaining products from thermoplastic polymers. When obtaining an item by this method, first of all, the polymer is brought to a viscous-flowing state under the influence of temperature and transferred to a closed casting mold.

With this method, it is possible to obtain items weighing from several grams to several grams, the thickness of the wall of which is 1-20 mm.

The pressure injection method is carried out on special automated Auger injection machines. Special casting molds with different structures are installed on the casting machines.

The cylinder of the casting machine (fig. Since the cylinder is constantly heated, the polymer first softens, and then turns into a viscous-flowing liquid. With the help of schnacks, it comes to a mold that, due to pressure, passes through the soplo (conical tube) and cools down. By filling the gap inside the mold, the polymer hardens quickly, and as soon as the shnek goes back, the mold opens, and automatically the item leaves it. After that, the pouring cycle under pressure is repeated again. Hence, the method of pouring under pressure can be considered a Facing process. This method is productive and characterized by high results, since the materials are heated outside the mold. In this case, the poured product is obtained in the highest and accurate sizes.

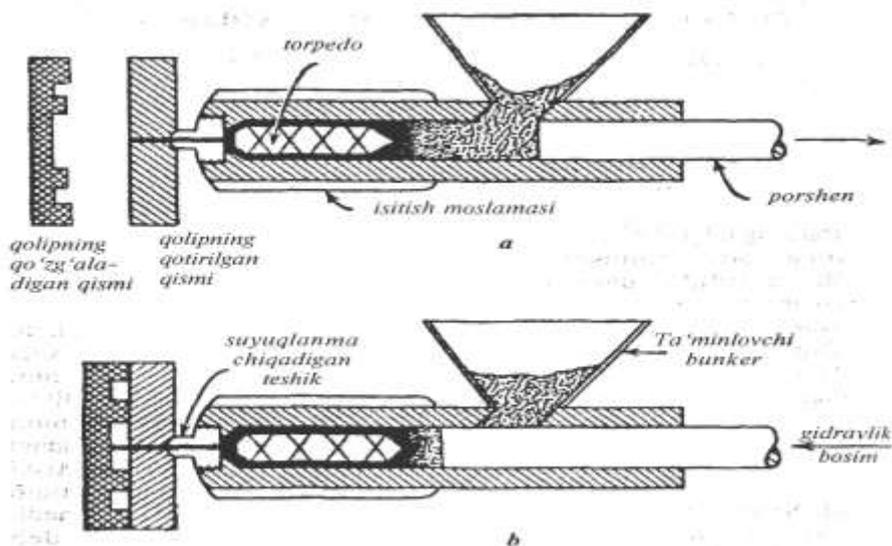


Figure 5. Casting machine scheme: a-open mold, b-closed mold

Items obtained by this method do not require additional processing. Depending on the number of cells in the mold, several items can be poured at the same time. That is why the productivity of Foundry machines will be very high.

The pressurized filling machine mainly consists of two parts:

plasticizing mechanism;

the mechanism of formation.

The first part serves to dose the materials, and the second part to establish the form of pouring.

The main classification parameters of the casting machine include the quantity or the volume to be sent, the volume is determined in the unit of material cm^3 , which goes into one casting.

In the most common thermoplasts, the mechanism axis, the material sending part and the molds will be located in a horizontal position.

The main parameters of the technological process include:

- Liquefaction temperature (T_s);

- mold temperature (T_m);

- injection pressure (PP);

- pressure in the mold (P_q);

- time to hold under pressure in the formation of the item (T_{it}), cooling time (T_{sov}) or time to solidify thermosetting materials in the mold (T_{qot}).

To analyse the injection process under pressure, it is necessary to know:

- the transition of the polymer to a flowing state

- its transfer to the regulatory zone is the assembly of the fluidity

- leakage of liquid in the "soplo-mold" system

- flow of liquefaction through the form-giver and form-gap channels

- structure of the item.

The main types of thermosetting plastics. Most plastics used in the preparation and repair of car details are thermosetting. They are obtained on the basis of various resins, which must have a high degree of gluing properties, resistance to heat and chemical influences, sufficient durability to break. Fillers, stiffeners, compounds that increase their plasticity (plasticizers) are added to tar (binding agents). It is necessary that the coefficients of expansion of binders and fillers from heat are approximately the same. Only then can a material with mechanical properties be obtained. In fact, plastics can operate at temperatures up to 120-150 °C. If Silicon inorganic tar is used as a binding agent, thermosetting plastics can withstand a long-term temperature of 300-350 °C, or even a temperature of 400 °C (for a short time).

Layered plastics filled with fibers. They are used in the preparation of structures that fall into the anchoring category. Filler lists, laid layer by layer, increase their strength and elasticity. laminated plastics, lists are released in the form of plates, tubes. They are widely used in the technique because of their high strength without a large mass. In the future, these plastics can be used to make thin-walled details with large gabions, such as covers, panels, cabins and hoods, fuel tanks, water radiator collectors, since their strength is the same as that of metal products, but the cost is three to seven times cheaper.

Glass textoliths are plastics with high bickering and consistency. Glass fiber is used in them as a filler. The mechanical properties of glass textolites obtained on the basis of epoxy resins are best. The strength of the details made of them is not inferior to that of steel details, but it is three times lighter than them. Glass textoliths, obtained on the basis of glass ice epoxy and polyhedral tar, are used in the preparation of large body details. Does not change its properties at high temperatures (up to 120 oS in water, up to 80 oS in diesel fuel) and low temperatures (up to -60 oS). In the collectors of water radiators made of glass textolite, no sediment (ogrindi) is formed, the details do not crack even when the water freezes due to the elastic deformation of the material.

Wooden sheet plastics (chipboard) rubber tar is obtained by pressing the impregnated wooden veneer. Its coefficient of friction is small. This is achieved by placing the wood fibers differently in the list layer. DSP is used in the preparation of bearings. When using such bearings, the surface of the metal shaft is not scratched, but polished. The noise is greatly reduced when shesternyas made of chipboard are used in combination with shesternyas made of metal, which work for a long time without distortion. The floor, as well as the board of trucks and pretzels are also prepared from the DSP. The plates can be one- and three-layer (places a simple crumb in the middle) and covered with veneer, plywood, paper.

Powdered plastics. Plastics with a cuckoo filler are little used in the production and repair of automobile transport and agricultural machinery, since their mechanical strength is not so high. When obtaining them, wood flour, cellulose, crushed quartz, cement taluck are used as a filler. From such plastics as carbolite, aminoplast, levers, details of the ignition pribors, the body of the pribors and other details that do not fall into a large mechanical nagruz are made.

Self-lubricating bearings are being used more often. When they are used, there is no need to lubricate from time to time, due to which less labor is spent on maintenance. In cotton, food machines, such bearings cannot be replaced with other bearings, since mineral oils are not allowed to touch the products on these machines. They are made from antifriction plastics (polycarbonate, fluoroplast, etc.) and filler (graphite, molybdenum, silufide). Bearings made of such materials are not lubricated, but their service life is more than twice. The very small friction coefficient (about 0.002) when lubricated provides for the use of bearings made of bimetallic materials. They were formed on the basis of steel, covered with a layer of bronze impregnated with a mixture of fluoroplast and molybdenum sulphide. In recent years, bearings made of antifriction wood plastic DKV - A-FB25 are being placed in place of Buk slip bearings made of grain and other combines.

Light plastics with gas filling. In the automotive industry, repair enterprises, industry and industry, a separate group of plastics is widely used gas-filled light plastics. They are obtained both on the basis of thermoplastic tar and on the basis of thermorreactive Tar. Outwardly, they are reminiscent of hardened foam, consisting of porous cages filled with gas inside. They are obtained by saturating the liquefied tar with air, nitrogen under high pressure or gases that are formed when certain chemicals decompose. When reheated (90-120 oS), the gases expand and whisk the plastic to form a checkered structure. Gas filled plastics have different properties

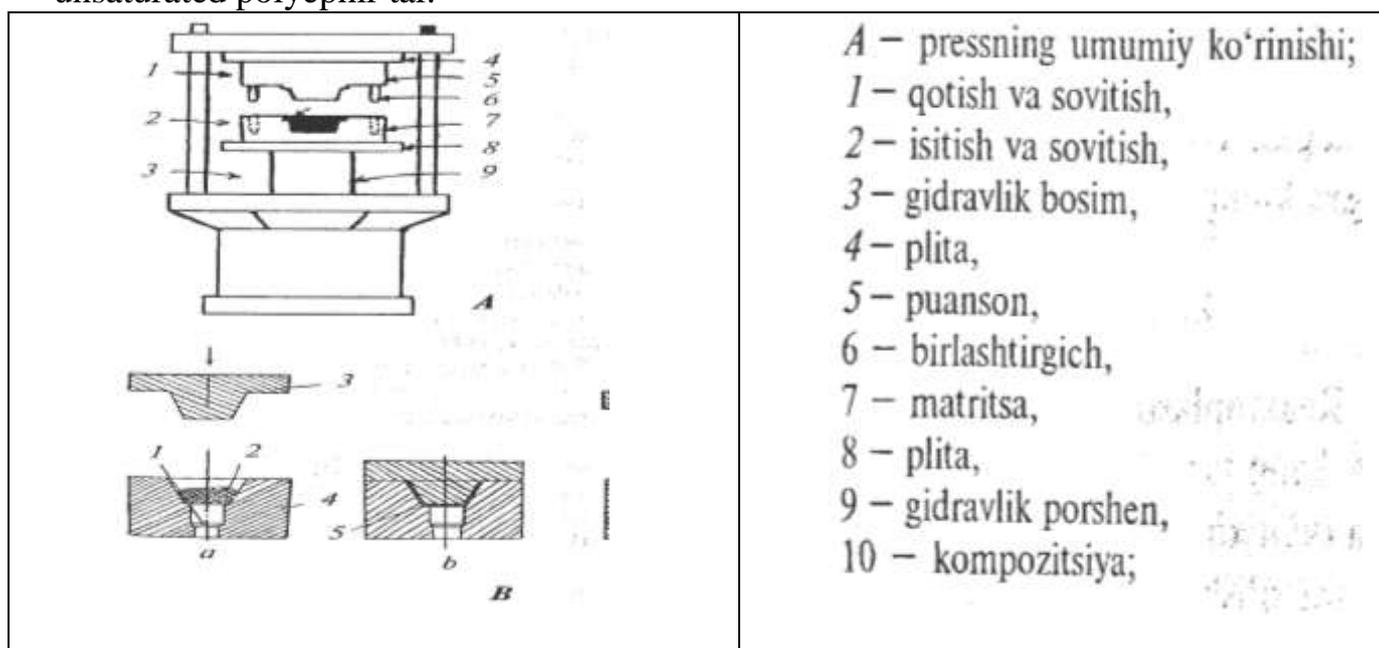
some of them are very hard, strong enough, others are soft, elastic. Their volumetric mass is small, the insulation properties from noise and Heat are high. Hard plastics are water resistant, do not conduct steam, gas, do not sink in water. According to the structure of gas-filled plastics are divided into two groups: 1) penoplasts are separated by gas bubbles from each other and from the surrounding environment by means of thin polymer layers, 2) proplasts are interconnected cells in them.

Taking items from thermoregatives. Pressing is a technological process. Through this method, an item is produced from polymeric materials. In this method, under the influence of pressure, the material undergoes plastic deformation and takes on The Shape of the mold. If the material being shaped has the property of plastic deformation without heating, then the process is carried out in a cold mold and called cold pressing, and the formation in a hot mold is called hot pressing.

The second method is used if it is necessary to reduce the viscosity of the material being pressed for formation, or if it needs to be exposed to high temperatures in order for the chocking reaction to go away during formation. The process presented goes under pressure. Hot pressing is called compression (direct) or pouring (transfery) pressing, depending on the equipment used in the process.

Thus, the extraction of an item from thermorreactive polymeric materials is based on the plastic deformation of the material, which occurs when the deformation is affected at a time by pressure and temperature. At this time, formation stagnation occurs due to the chocking of the binding chemical reaction (a three-dimensional structure is formed).

The pressing method is most often used when obtaining products from ready-made compositions based on phenol-formaldehyde, melamine for-maldegide, epoxy, unsaturated polyephir tar.



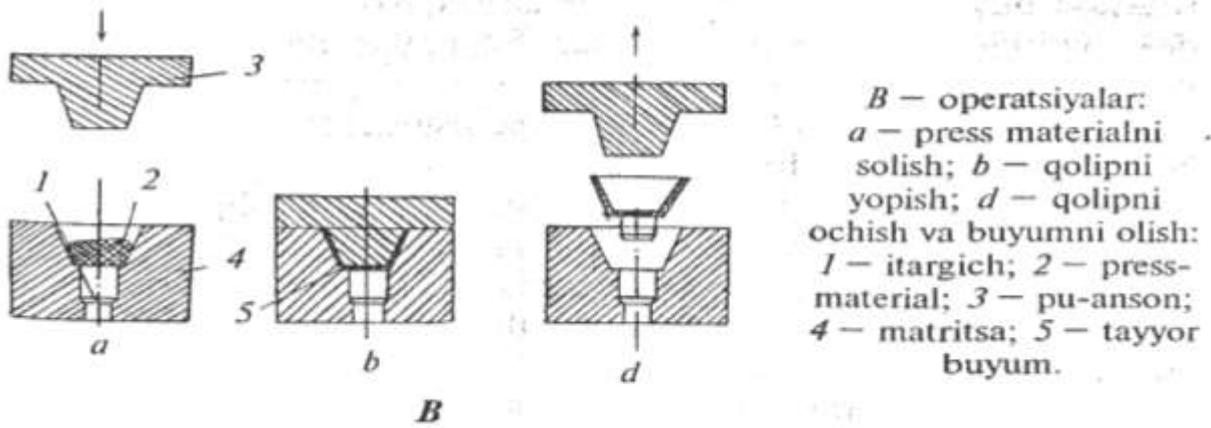


Figure 6. Compression pressing operations scheme

Formation of an item from a powdery polymer and plastizols. Rotational formation is a method for the production of hollow objects. To do this, the thermoplast must be in the form of a polymer powder or paste.

The formation consists of the following operations: a certain amount is placed in a hollow mold made of polymer metal, covering its mouth and turning it over.

The mold is heated to the liquefaction temperature of the polymer. When the metal mold rotates, the polymer material is evenly distributed over the inner surface, compacting and forming a monolithic coating of clear thickness. In this, the liquefaction adheres to the mold due to the centrifugal force and adgesia. After cooling, the mold will open and a hollow finished item will be obtained. The two-axis Rotary forming device is shown in Figure 7.

Cooling the item can be one-or two-sided. It depends on the method of formation and the structure of the item. The item is cooled by sending compressed air.

Cooling should be done slowly, otherwise the item may tilt. In the process of cooling, an object enters to a certain extent, and this process depends on the degree of orientation of the polymer molecule.

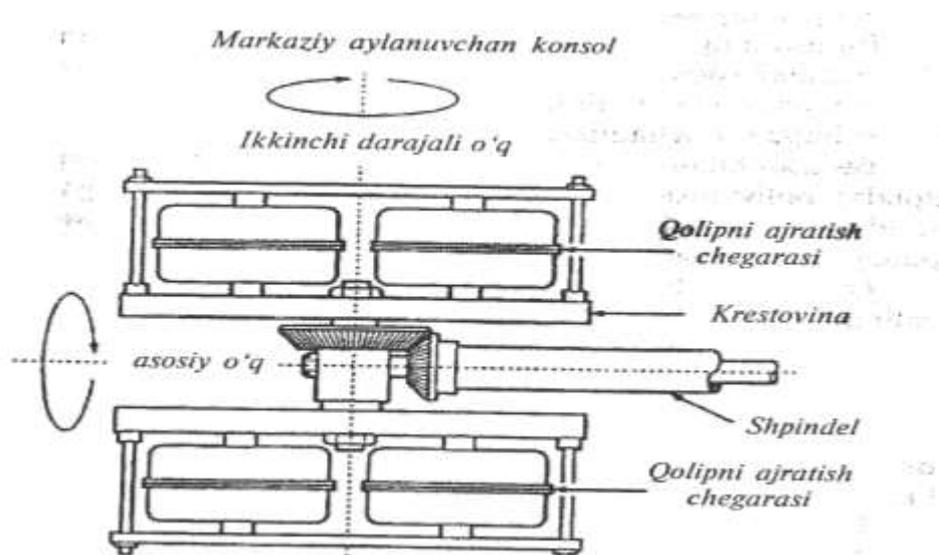


Figure 7. Two-axis Rotary forming device

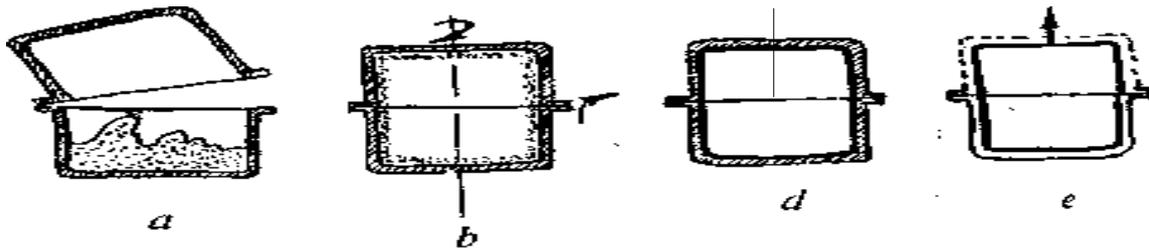


Figure 8. Rotational Formation Operations

a - filling the mold with raw materials; b-forming the item; d - cooling the item; e-removing the item from the mold.

Obtaining a hollow object by the method of rotational formation (fig.:

- large-sized items can be obtained;
- the thickness of the item is almost the same;
- the waste practically does not come out;
- gives residual voltage on the item;
- the cost of the device and equipment is cheap;
- high economic efficiency.

The disadvantages of this method include:

- formation time is long;
- the density of the material of the item is low;
- the dimensions of the item are not exactly clear.

To obtain an item with this method, the following thermoplasts (in the case of a paste) are used: polyvinylchloride, polyethylene with a low and high density, and their mixture; polyethylene, polyamides filled with carbon powder.

The largest size of removable items is 500 L, the thickness of the wall can be up to 16 mm. Forming by blowing. Taking zagotovka in a "sleeve" mold by extrusion (or casting under pressure) from thermoplasts and blowing it inside, the so - called Blow-forming (fig.

This method mainly uses the following polymeric materials: polyethylene polystyrene, polyethylenterephthalate, polyvinyl chloride, etc. Various containers can be obtained from these materials: bottles, canisters, containers with a volume of 0.005 to 500 L.

The main parts of the machine are: extrusion machine, head, shape forming mold, mold closing and opening mechanism and pneumosystem for blowing.

The main process is extrusion, which is practically no different from the processes that occur when obtaining an item from thermoplasts by the method of painting.

The main essence is that when the front part of the zagotovka coming out of the head cools slightly, the part close to the head becomes hotter, so blowing the zagotovka in relation to its length can be different.

This method can be of two types:

Pipe-taking the zagotovka in the mold using an extruder and blowing compressed air into it.

In the casting machine, take a mold-zagotovka and blow it on this machine.

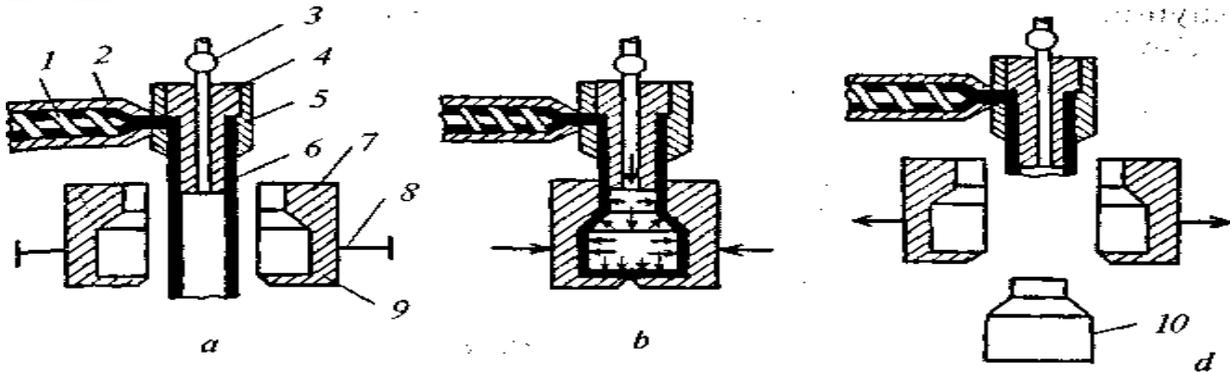


Figure 9. Scheme for obtaining inflatable hollow air containers by extrusion method

a-obtaining a tubular zagotovka by the extrusion method; B - blowing zagotovka and forming an item; d-obtaining an item. 1-shnek; 2 - extrudersilindri; 3 - Tap for sending compressed air; 4 - dorn; 5 - mundshtuk; 6 - tubular zagotovka; 7 - semi - mold; 8 - semi-rigid closure and opening device; 9-press edge; 10-item.

Therefore, as much as possible, zagotovka's viscosity is caught at a high level so that zagotovka does not break off. If the leakage rate of liquefaction is increased, then the polymer may undergo destruction.

Control questions

1. What requirements are poured into them when obtaining an item by pressure injection method from thermoplastic and thermorreactive materials?
2. How do the technological parameters of pressure casting affect the quality of the item?
3. Under pressure, injection machines are divided into classes according to which capacitor?
4. explain the casting mold constructively.
5. What factors depend on the cooling time, cycle time?
6. How do compression and transfer pressing methods differ from each other?
7. What factors do the holding time under pressure depend on when pressing?
8. Mainly from which plastics is an item obtained by the pressing method?
9. What should be the condition of the material in order to obtain an item in a rotational way?

Module 4. Rubber applied in vehicles

Plan:

1. General information about rubber.
2. Production of rubber.
3. Getting rubber materials.

4. Physical and mechanical properties of rubber.
5. Change in the properties of rubber materials under the influence of temperature.
6. Changes in the properties of rubber in the process of wear.
7. Changes in the properties of rubber under the influence of liquids.
8. Materials for repairing car tires.

General information about rubber. Rubber products are widely used in all sectors of the national economy, especially in the tractor and automotive industry, since rubber, which is considered the main component of rubber, becomes very elastic. Rubber can deform very strongly (up to 1000 percent), but after the load is obtained, the rubber almost completely returns to its previous state. In addition, rubber has a high chemical resistance, the ability to resist decay, has good electrical insulating properties, the density is not so great. Modern cars have several hundred different rubber details. The only part of the rubber to be produced (about 60 percent) is spent on the production of tires for the autotractor technique.

The basis of any rubberized material is rubber, and in modern passenger cars, details with a total number of up to 300 names are made of rubber (and in freight cars-from 200 to 500 details), for the preparation of these details, 250-400 kg of rubber, that is, 500-800 kg of rubber materials are spent, and in cars of the The total mass of rubber materials spent on cars is 8-9% of the mass of the car, while the total cost of the car is 10-40%, from which it seems that rubber is a valuable and rare material.

The reason for the widespread use of rubber in the technique is:

- high elasticity property of the material (for high quality rubber
- the specific elongation in the stretch reaches 1000 percent);
- having sufficient strength (the best varieties of rubber
- the strength at the break reaches 40 MPa);
- very low gas transfer and complete water impermeability;
- high dielectric properties.

Based on the characteristics listed above, various types of rubber products are produced from rubber materials: tires, biker hoses, shock absorbers, belt transmissions, gaskets, Thessalonians, couplings, transport straps. In the manufacture of cables, conductors, electrical machines and equipment, rubber is used as an electrical insulator.

Production of rubber. Previously, natural rubber (TK) was used, which was obtained from the sap of a rubber plant. With the increase in rubber production, rubber became scarce. At the moment, only part of the rubber is made on the basis of various synthetic rubbers (SK), which are considered oil refining products. But at the first time, the physical and mechanical properties of rubber obtained from synthetic rubber were worse than that of rubber made from natural rubber (it had a lower strength, relative elongation, resistance to eating and Frost). But the achievements of the petrochemical industry make it possible to produce from rubber obtained from natural rubber.

Rubber is a high molecular compound with a molecule mass of 100-500 thousand (the number indicates how many times the molecule is heavier than a

hydrogen atom). A large long polymer molecule tries to round, but this is opposed by the force of interaction of molecules. That is why rubber is so elastic.

Natural rubber (TK) is obtained from rubber carriers (sap) of the geveya tree growing in Brazil. Due to climatic conditions, it is impossible to grow a geveya tree in our country, plants with rubber carriers of a different composition do not have production significance. Therefore, synthetic rubbers are used as raw materials of the rubber industry in our country. The homeland of SK is the former Union. For the first time in the world in 1932, S.V. Based on the Lebedev method, butadiene SK is synthesized in factory conditions, this rubber is branded with three harfs-SKB. In terms of its quality, SKB is inferior to natural rubber, so it is squeezed out by other SKS. At the beginning of the 60s of the last century, a stereoregulatory butadiene rubber SKD (divinildi) was produced. These rubbers do not lag behind TKS in elasticity, better than TKS in terms of resistance to eating and exposure to cold.

The most promising of stereoregulatory SKS is the izoren rubber SKI (for example, SKI-3). Its formula is able to completely replace it, since its properties are the same as that of TK.

Monomer polymerization products are widely used in the preparation of rubber details of cars.

Promising universal SKS include bottleuch-isobutylene-sopolimeri with isoprene. This material is one of the best in the production of car cameras (it has the property of high gas permeability).

There are currently more than 200 types of SCS. Data on the main characteristics and area of use of rubbers are presented in Table 3.1.

Table 3.1. The main characteristics and field of use of rubbers

Rubber	Main features	Area of use
Natural (TK)	it has a high consistency and elasticity in the structure. Suitable for use at temperatures from 60os to 100os.	3,6,8,10,12
Butadienstrual (SGS)	it has a high strength in structure and is resistant to wear and tear. Suitable for use at temperatures up to 100os. Resistant to the effects of cold at high temperatures (up to 75oS).	11,12,13
Butadienmethyl-stiralli (SGMS)		3,6,10,12,14
Izaprenli (SKI)		2,6,8,12,14
Butadienli (SGD)	It has a very high mechanical strength, resistant to decay and cold effects.	6,8
Chlorprenous (niatrit)	Has high elasticity, wear-resistant. Suitable for use in the environment of petroleum products at temperatures up to 120-130os. Vulcanized without raw materials.	1,4,5,7,9,11
Butadiennitrilli (SGN)	Similar to nairite. Improved resistance to thermal effects.	4,5,7,9,11,13
Dimetilsivarnishsan (SKT)	Resistant to thermal effects, can be used for a long time at temperatures from 600s to 3000s. It has a high dielectric property. It dissolves quickly in petroleum products.	3

Ftorkauchukname	Similar to SKT, but insoluble in petroleum products.	4,5
Etilenpropilenli (SKEP)	Suitable for use at temperatures from 500s to 130os, has a high electroisolation property.	1

Explanation. The numbers in the third column indicate the area of use of rubber: that is, 1-used for compacting cabin windows and other details; 2-used for compacting cabin doors and other details; 3-used in the preparation of compressors (rings, gaskets, cuffs, etc.) suitable for use in the environment of weak solutions of air, water, acid and alkali; 4-used in the; 6-used in the preparation of air, water, shock absorbers; 7-used in the preparation of shock absorbers suitable for use in petroleum product environments; 8-used in the preparation of force transfer details (discs, bushings, blocks) suitable for use in air environments; 9-used in the preparation of force transfer details suitable for use in petroleum product environments; 10-used in; 11-used in the preparation of protective details suitable for use in petroleum product environments; 12-used in the preparation of auxiliary details suitable for general purpose applications suitable for use in the environment of weak solutions of air, water, acid and alkali; 14-used in the preparation of tires.

Getting rubber materials. The use of natural and synthetic rubbers in their pure form is limited (used in the preparation of adhesives, in the preparation of insulating tapes, compacting gaskets). because they have a number of disadvantages: including insufficient durability. The strength of TKs does not exceed 1,0-1,5 MPa, for SKB and styrene SKS-0,5 MPa. One effective way to increase the strength of rubbers is vulcanization.

Vulcanization is The Binding of rubber molecules to sulfur atoms. As a result of vulcanization (for example, TK), vulcanized rubber with a break strength of around 25 MPa is obtained, a process that is relatively effective at a temperature of 140-150 oS. The main reason for increasing the strength of rubber during vulcanization is the formation of a valence bond ("sulfur bridges") between the rubber molecules.

Sulfur is added to the rubber in the amount necessary to increase its strength and elasticity. In this, the long macromolecules of the polymer become a mesh structure, forming a carcass that gives elasticity to the rubber. For example, in rubber, where car tires and pokryshkas are made, 1-3 percent of the proportion of rubber will be sulfur. The increased sulfur content in rubber reduces its elasticity at the same time as increasing its strength. Around 50 percent sulfur can be added to rubber, in which a material is obtained-ebonite, which is very strong (strength in elongation is 52-54 MPa) and is not at all elastic (solid), chemically inert. From ebonite, details are made that are used for electrical purposes, including a jar of batteries.

Components of rubber. In addition to rubber and sulfur, any rubber material will contain other components - ingredients.

To speed up the vulcanization process, vulcanization accelerators (tiuram, kaptaks, etc.) are added to the mixture of rubber and vulcanizing agent, and fillers are added to increase the strength. A device is used as an amplifier, which is the most massive. Soot powder coated carbon mold parts size is 0.03-0.25 μm . The unit is

added to rubber materials such as other amplifiers in the amount of 20-70 percent compared to rubber in rubber.

In addition to the institution, zinc, magnesium, silicon oxides, a number of salts (chalk, gypsum), synthetic resins, etc. are used as fillers. A number of white fillers (white soot, zinc oxide, etc.) are used to obtain colored rubbers, while the oddate soot cannot be used because it is black because it gives the items a black color.

Fillers are much more effective than SKBS, SKS and SKNS. When vulcanizing a mixture of these SKS with fillers, their consistency is 10-12 times higher than that of non-filler Vulcanizates, and their strength at the break reaches 10-30 MPa.

In addition to the above components, no more pigments (for coloring), plasticizers (which relieve processing and increase its frost resistance), antioxidants (anti-wear), pore-forming (when obtaining porous rubber), etc. are added to the composition of the rubber.

A mixture of non-vulcanized rubber, sulfur, fillers and other ingredients (the total number can be up to 15) is called a mixture of raw rubber or rubber. From raw rubber, products of various shapes are produced based on different methods, and this is the final processing operation for rubber vulcanization serves. These items will be suitable for use only after vulcanization. Raw rubber is simply referred to as rubber after vulcanization.

The vulcanization process is an irreversible process, so the rubber contained in the rubber cannot be extracted in its pure form. Let's dwell on the process of converting rubber, which has passed its working life, into regeneration, that is, devulcanization. To obtain rubber regenerates, old rubber products are heated in an environment of various liquids to a temperature of 150-190°C. In this case, the valence bonds of the carbon atoms contained in the rubber are interrupted, and the sulfur bridges are broken. The result is a plastic material with a low molecular mass (6000-12000). It will be possible to re-vulcanize this material and add ingredients to the composition. It will be possible to add raw rubber to the regenerate composition, in which it will be possible to save rubber. On the basis of these regenerates, dam ribbons of tires and rubber mats are produced.

As a regenerator, waste products from old rubber products and rubber-producing enterprises can be used. They not only make rubber cheaper, but also reduce its tendency to wear and tear, as well as increase its resistance to the effects of petroleum products.

According to the field of use, rubber is intended for general work and is divided into special types. Rubbers belonging to the first group are able to work in air, water, weak solutions of acids and alkalis. They can be obtained both from natural rubber and from synthetic rubber. Tires, tapes, transporter tapes and arbors are made from them. Rubber with special properties (which can work at very high and very low temperatures, resistant to the effects of nephu products, etc.) is called special rubber.

The technical rubber obtained from natural rubber has a high tensile strength and elasticity. It adheres well with the help of raw rubber glue, which is obtained

from natural rubber. They can work at temperatures from 60 to 1000s. When heated further, the rubber softens and loses its operational properties, while at low temperatures it becomes brittle.

The main part of the rubber intended for general work is spent on the preparation of tractor and car tires. Rubber obtained on the basis of butadienstrual (SKS, SKMS) and isoprene rubber (SKI) has good properties. They differ in strength to stretch, resistance to decay. It can work at a temperature of 80-100os, has high frost resistance (up to minus 75os). Since the mechanical properties (especially the elasticity) of rubbers are close to those of natural rubbers, they attach firmly to the cord. Special tires that meet the requirements for mechanical strength, wear and frost resistance are made of removable rubber based on divenil rubbers (SKD). These rubbers are far superior to natural rubbers in their aforementioned properties.

Cameras, as well as tires without a camera, will need gas-tight and oxygen-resistant rubber to prepare a hermetic layer. Bottlecocks (SKB) are in demand. While they have good mechanical strength, they have high heat resistance (up to 120os). Polyurethane rubbers also have the above properties, from which they are resistant to ozone and petroleum products. Tires with replaceable tread are made from them.

Rubber resistant to the action of oil, gasoline is made from tapes, hoses, compression gaskets, cuffs and other details that work by touching solvents. They swell at most 1-3 percent in fuel and oil. Oil from nairite, gasoline-resistant rubbers (chloroprene rubber) are common. This rubber is vulcanized under the influence of temperature without sulfur. Rubbers obtained on the basis of nairite can work in the environment of petroleum products at temperatures up to 120-130os. They are elastic, do not wear out quickly. The operational properties of rubber made from butadiennitrile rubber (SKN) are even better. In addition, they are also resistant to the action of dilute acids and alkalis.

In most cases, rubbers will be needed that will tolerate the effects of high temperatures well. They are mainly obtained from Silicon inorganic rubbers (Sgt), which can work for a long time from minus 60 oS to +300 oS. It has high dielectric properties, the specific properties of which are such that the operational properties do not change even under cernamic conditions. Therefore, items are made from them that are used in a tropical climate. Their rapid melting in oil products is a big drawback. This drawback can be lost by adding a fluorine atom to the rubber molecule. In this case, SKF rubber is obtained. This rubber does not burn, is heat-resistant (up to 300os), is used for reliable, efficient compaction of hydraulic hose assemblies. When repairing pneumatic hoses, non-vulcanized materials are removed. They include rubber profiled with a tread. They are designed to form a walking path or a full-profile tread. These materials also include layered, hermetic camerabop rubber bands. They are used in repairing camera-free tires and cameras. To get elastic rubber from raw rubber, it is enough to heat it to a temperature of 140-150 oS (preferably under pressure).

Selection of rubber products. In order to increase the strength of rubber details, it is necessary to grind them with other blowing (aerating, wire frame,

metal fibers) elements (fittings). The strength of the rubber object to be obtained as a result of this is largely determined by the strength of the reinforcing element contained in the rubber. The elasticity of the grinding rubber details in the stretch will be significantly less than the elasticity of pure rubber, but will retain the properties of deformation at the required limit in bending and compression.

The sentence of important reinforced rubber products used in cars includes rubber-gas hoses, transmission bands, etc.

Car pokryshkas are an armoured item with expensive and very high requirements applied in cars, in the preparation of which special fabrics are used - cord, chefer, etc.

To repair damaged areas of the carcass, Board of pokryshkas, to strengthen damaged areas of the carcass, materials such as a court with the addition of rubber, a chefer with the addition of rubber and plastires (cross-sectional patches made of cord with the addition of rubber) are used. It is recommended to use a cord from which a repairable pokryshka carcass is made. It is best to use a cord made of Capron fibers, since it is solid, it will be possible to reduce the thickness and mass of the patch, reducing the vibration of the wheels.

Physical and mechanical properties of rubber. Tensile strength, relative and residual elongation of rubber. The main deformation and strength properties of rubber include the properties of plasticity and elasticity, anti-stretch strength, relative elongation in stretching, residual elongation in stretching, relative tension in a given elongation, etc.

Since stretching forces are most dangerous in objects and materials made of rubber, their strength is characterized by stretching. Rubber products lose their strength over time (static exhaustion appears), and finally they become unusable.

The time that a rubber item has gone (breaking) from being exposed to immutable tension to becoming unusable is called its consistency during this time or its long durability. As the amount of tension increases, the durability of the distance decreases dramatically. The property of rubber to maintain its shape at the time of stretching depends on the rate of deformation, temperature, composition of the rubber and its structure.

The higher the stretching speed, the less force is required to break the rubber material. Changes in temperature during deformation affect the strength indicator. Usually, with an increase in temperature, the strength of the rubber decreases, and vice versa. Testing work is carried out at a certain speed and temperature, which is presented in the state standard or technical specifications, in order to obtain comparable samples.

The strength of the rubber also increases sharply at the expense of active fillers, which are added to their composition. However, adding a plasticizer in excess of the norm also reduces the strength of the rubber.

Inside the rubbers there is a high elasticity of TK, SKI-3, chlorprenes. SKN, BK, SKF and acrylic rubbers have less elasticity.

The relative elongation of rubber in elongation refers to the ratio of the length of the rubber material at the time of its discontinuity to the initial length of the material relative to the initial length of the rubber material.

Some of the standard indicators of rubber materials of three types, which are widely used in the repair of the most important rubber details of the car, are presented in Table 3.2.

The relative and residual elongation of the rubber material together characterizes the elasticity property of the rubber. The greater the difference between relative and residual elongations, the better the elasticity property of the rubber material.

Rubber and rubber differ in their mechanical properties from elastic (flexible) bodies and liquids. They are high-molecule compounds that have a high range of deformation properties even at relatively small voltages. This kind of deformation is called high elastic deformation, and the material itself is called elastomers.

Table 3.2. The main indicators of the mechanical properties of rubber applied when repairing car tires

Rename	Strength limit in interruption, MPa, at least	Relative elongation at the break, %, at least	Residual elongation in interruption, %, at least	Hardness on the shore
Protector	14	450	-	55-65
Camera	9	550	40	-
Laminated rubber for repair	20	500-850	40	at least 45

In addition to reversible deformation in rubber and rubber, there is also irreversible deformation. It is also referred to as residual deformation. The appearance of residual deformation is explained by the fact that in the rubber molecule some parts change their place in relation to each other. When rubber is vulcanized (rubber formation), the linear long molecules of the polymer combine with each other through solid chemical bonds and lose the property of free movement among themselves. Therefore, the residual deformation in rubber is sharply reduced. For this reason, the ratio of reversible and irreversible deformations in the specified materials is different: if irreversible deformation prevails in rubber, then reversible high elastic deformation prevails in rubber.

Vulcanizates of all rubbers (except ebonite) will be similar in their displacement at high temperatures from the outside to metals. As a result of the presence of rubber in a loaded state, residual deformation occurs. The longer the period in the case of rubber loading, the greater the amount of residual deformation. As a result, strongly deformed details change their shape and size over time and do not return to their original state. Such cases are even more conspicuous in thin-walled items. For example, when storing clean rubber and even scraped hoses in a pile State for a long time, they take a crushed form, the hoses are clipped off from their places bent at an acute angle, it will not be possible to restore them.

Based on the above points, the following conclusions can be drawn: in order to ensure the preservation of rubber details of a high processing property in the long term, it is necessary to create such conditions when storing them, as well as when

operating cars, in which the tension and deformation generated in the details should be as small as possible. When storing details, it is relatively easy to create such conditions, while in the process of using cars it is relatively complex.

As an example, let's dwell on measures to preserve the properties of automotive pokryshkas, which perform important tasks and are valuable. When storing car pokryshkas, they are not allowed to be superimposed. They should only be placed in a row upright on special stollages, while periodically (every 2-3 months) it is necessary to replace the part of the tread that touches the floor of the stollage.

To ensure that the pokryshkas used in cars are well maintained, it is necessary that the duration of parking an unloaded car in one place is no more than 10 days (2 days for a fully loaded car). In cases where the car is stationary for more than the above periods, it is necessary to lift the car on special supports so that the pokryshkas are provided in a position that does not touch the ground.

It is necessary to drive it at a maximum speed of 15 km/h for 20-25 minutes, and then gradually increase the speed when the car is in the open air for a long time.

When technical operation of tires, it is necessary to prevent them from overloading and to ensure that the air pressure in them is normal. These requirements are aimed not only at maintaining the shape and dimensions of the tire, but also at ensuring that they do not reduce the service life, allow too much heat to be released from them and fuel consumption to increase.

Hardness of rubber. Hardness is one of the main physical and operational properties of rubber products, it is indicated for each material (metal, mineral, plastic, etc.) in state standards and technical conditions.

Hardness is understood as the resistance that is exerted on the surface of a material to sink or scratch another solid material.

With determination of hardness, one can think about the quality of the prepared rubber. Because this indicator is one of the main indicators characterizing in what quantity the vulcanizing substance, filler and plasticizer were taken and mixed. Hardness is determined for vulcanized rubber materials, while depending on its quantity, a certain understanding of the elasticity of rubber can also be obtained.

The hardness of rubber products is measured by the depth of immersion of another (sharp) material of different shapes, which is very hard on them.

The hardness of rubber depends on the quantity and properties of rubber, vulcanizing agent, filler and plasticizers that are part of the rubber mixture. It is possible to increase the degree of vulcanization of rubber by adding active accelerator substances (thiazole, thiuram, sul phenamide) to the composition of the rubber mixture and increasing their amount. This in turn leads to an increase in the hardness of the rubber. Plasticizers, on the other hand, reduce the hardness of the rubber.

Rubber is divided into three groups according to the degree of hardness (table 3.3).

Table 3.3. Division of rubber into groups according to hardness

Group	Degree of hardness	Shore A hardness limit according to hardness meter
I	Lower hardness	35-50
II	Medium hardness	50-70
III	High hardness	70-90

In order to facilitate the preparation of products from raw rubber, it is specially treated, that is, the rubber is softened to the required amount. When measuring the hardness of such rubber, the hardness meter tool needle sinks into the sample in a continuous view, resulting in a decrease in the instrument indicator and close to zero after a few minutes. In the process of vulcanization, the plasticity of the rubber decreases and completely disappears at the last stage, the hardness and elasticity of the rubber increases as a result of the reaction of new sulfur servings and reaches a certain amount in the finished vulcanized rubber.

According to technical requirements, the mode of vulcanization of such rubber is considered correctly selected if the needle of the hardness meter tool does not leave a noticeable mark on the vulcanized rubber material.

The fact that the rubber material has an excessively high hardness is also called excessive vulcanization of this condition, not being a normal condition.

Resistance of rubber to eating. The terms stagnation or resistance to wear are applied to rubber materials, a term that in meaning corresponds to the term wear resistance used in the lubrication process.

Most rubber products – all kinds of pokryshkas, transporter tapes, etc. are eaten (becoming unusable) by the surface layer under the influence of the friction force that occurs due to slipping during their use. Increasing the resistance of rubber products to be eaten (resistance to being eaten) is one of the main conditions for increasing the thoroughness of the products produced in the rubber industry.

Eating rubber items can occur in slip mode (traffic tape movement) and rolling mode (tire movement). However, rolling during tire use in addition to friction, slip friction is also generated (for example, when vehicles brake). Based on this, the test work on the resistance to eating is carried out in the rolling mode, where the wood goes along with the slip.

The indicator of resistance to eating is called a comparative indicator of wear and tear, and this indicator is expressed in a decrease in the size of the sample being tested per unit of time, that is, the amount of eaten. For rubbers used in the preparation of automotive pokryshka treadmills, this indicator should not be more than 0.08 mm³/j for passenger cars and 0.14 mm³/j for trucks.

Friction leads to the fact that the rubbing surfaces are eaten and they change in size. Friction is characterized by a coefficient of friction, that is, the greater the coefficient of friction, the higher the intensity of friction.

The coefficient of friction depends on the composition of the rubber and the surface of the abrasive material on which it is rubbed. Depending on the types of friction and eating, the numerical values \ u200b \ u200b of inedible or the

magnitude opposite to it, that is, the coefficient of resistance (endurance) to eating, will be different.

The braking capabilities of cars are also inextricably linked with the coefficient of friction. Depending on the type of coating of highways and road conditions, the coefficient of friction will be in the range of 0.1-0.8.

The coupling of the car tire with an asphalt tobeton coating ensures that the coefficient of friction between the tread and dry asphalt tobeton is 0.6-0.8. However, a small amount of rain reduces the coefficient of friction between the tread and the asphalt tobeton by two times. Mud residues on roads further worsen the coefficient of friction. At times when the road freezes, this coefficient will be equal to 0.1. In such conditions, inconveniences arise when handling a car.

Change in the properties of rubber materials under the influence of temperature. Rubber changes its properties much more significantly as a result of temperature changes, including when details made of rubber materials are heated, and also lose their working properties when cooled.

The consistency limit of rubber increases as a result of a decrease in air temperature, while its elasticity decreases and becomes zero at a temperature of minus 800s.

The main disadvantage caused by a decrease in air temperature is a decrease in the elasticity of the rubber. This results in the fragility of the rubber material approaching the fragility of the ebonite.

Most rubber materials lose the property of deformation at the required threshold at a temperature of minus 450s. Only Vulcanizates obtained on the basis of rubber resistant to the effects of frost retain their necessary elasticity at temperatures of minus 500s and below. It follows from this that in the winter season, special attention should be paid to rubber details and treated with caution.

Therefore, in the winter season, before carrying out all the work related to the assembly and dicmantling of rubber details, it is necessary to heat them to room temperature. It is important to warm up the pneumatic tires when they have been standing for a long time or the car has been in the cold for a certain period. Tire heating is carried out directly by moving the car, in which the tire heats up due to the fact that the continuous deformation of the rolling tires is converted into thermal energy. But at the initial moment when the car is driven up, the tires will not have enough elasticity, as a result of which, under the influence of not very large dynamic loads, the tire can easily be damaged. That is why it is recommended to move at a small speed on relatively flat sections of the road, where there are no dangerous turns of the road in the first moments when the car is driven from its place, and not to brake at once.

When using cars in the winter season, details made of rubber resistant to the effects of gasoline and oil should be treated with high caution. Because the resistance of such rubbers to the effects of frost is very low and becomes brittle at a temperature of minus 200 C.

It is forbidden to install tires that are frost-resistant and durable on one car (even if the sign is the same), since the heating period of the tires is a Turlich.

As a result of increasing the temperature to 110-1200 C, the relative elongation of the rubber increases, and when the temperature increases from 1200 C, the relative elongation of the rubber decreases. The transition of relative elongation of rubber from increasing to decreasing is explained by the partial interruption of sulfur bridges between rubber macromolecules at a temperature of 110-1200 C. Thanks to this, the plasticity property increases, while the elasticity of the rubber decreases at once.

With an increase in temperature, the operational properties of rubber change only for the worse - the strength, resistance and hardness of the rubber against decay decrease, the residual elongation and deformation as a whole increase. When the rubber is heated from 200 C to 1000 C, its strength at the break decreases by two and even three times. Also, when the temperature is transferred from 200C to 1000C, the resistance and hardness of the rubber against decay deteriorate to an even greater extent.

As a result, with an increase in temperature, the distance traveled by car tires decreases (fig.

In addition, as a result of greatly decreasing the hardness and strength of the rubber, cracks may appear in the vehicle pokryshka tread when the car walks through unevenness, and pieces of the tread may become rolled out.

Summing up from the above points, the following can be said: all rubber details, especially those that deform in the process of work, in most cases should be heated in the winter season, and in the summer it is necessary to develop measures to cool them down, as well as reduce their heating. In order to keep the car tires in good condition, the above measures must first be followed. It is also necessary to ensure that the air pressure in the car tire is in moderation and is not overloaded.

Failure to comply with this simple rule when using tires will cause them to overheat, and as a result, harmful consequences will occur.

In hot summer Times, tires that are not overloaded and have normal air pressure can heat up significantly. In such cases, it is necessary to reduce the speed of movement in order to ensure that periodic parking on the road to cool the tires, sometimes, does not result in an accident caused by overheating of the pokryshkas. Because these indicators directly strongly affect the operating mode of the tire.

Changes in the properties of rubber in the process of wear. Due to the presence of non-solid bonds in the rubber molecule, oxygen in the air reacts with the polymer even at room temperature, causing it to wear out. Therefore, over time, the rubber loses its properties, becomes brittle, and cracks appear on the items. The process of wear is accelerated when heated, in light, in acid, under the influence of alkali, petroleum products.

Rubber and Vulcanizates, like all unsaturated compounds, are susceptible to various chemical changes. Rubber products oxidize continuously in the process of Use and storage. This results in changes in the chemical, physical and mechanical properties of rubber. Only ebonite becomes a fully saturated compound as a result of attaching a possible amount of sulfur to the rubber macromolecules. The sum of all changes in rubber during long-term oxidation is called Wear of the rubber.

Wear belongs to the category of complex multi-stage change, in which at certain stages the elasticity of the rubber is significantly reduced by its resistance and strength against decay. In other words, over time, the working capacity of rubber products, therefore, the reliability of the operation of the car decreases. The sentence of the changes that occur in the wear of rubber includes the non-restoration of the loss of rubber elasticity. As a result, the rubber becomes characterized by a high degree of fragility, as a result of which cracks appear in its surface layers, which gradually deepen, and as a result, the item completely fails.

Prevention of wear and tear of rubber is carried out on the basis of different styles. Slowing down the wear of rubber it is considered very effective to add anti-wear additives (inhibitors) to the rubber composition. Anti-wear additives are mixed in an amount of 1-2 percent compared to rubber in rubber, as a result of which the oxidation process of rubber slows down several hundred and even a thousand times. For this purpose, some rubber products are manufactured by placing them in hermetic polyethylene sheaths.

However, in order to prevent wear of rubber, it is not enough to use only technological means, therefore, it is necessary to apply a number of additional operational measures (some measures were thought out above). As a result of the increase in temperature, the wear of the rubber increases, including the wear rate of the rubber increases by 2 times, when the temperature increases every 100 C. In high-load sections, the oxidation intensity of rubber is even higher.

In order to slow down the Wear process of rubber, it is necessary to achieve that the rubber products are not deformed as much as possible and can be used at temperatures not higher than 300 C.

Protection of rubber products from sunlight is included in the sentence of important operational activities. Because sunlight creates wear and tear caused by light. A feature of this effect is that wear is strong on the beam falling sections of the rubber. In this case, the violet and ul of the spectrum are relatively active. To prevent wear from exposure to light, the car should be kept indoors or under special winding sheaths.

It is necessary to keep at least the tires and rubber details from the sun's Rays, at least in the conditions described above. In doing so, they should be wrapped in a white sheath or fenced off with a hedge.

Rubber products should be stored at a temperature of 5-20o C, where light falls little, where water and petroleum products do not touch.

Changes in the properties of rubber under the influence of liquids. When using cars and storing rubber products, there is a possibility of touching them with water and petroleum products. Water does not have a strong effect on the properties of rubber for a long time. Water has a strong effect on the scraped details, metal fittings are intensively corroded in a humid environment, while cotton-paper fiber fabrics lose their strength and rot quickly. Therefore, it is necessary to keep the selected rubber products (metal frame, wire and gaslama) dry until the opportunity arises, and in mandatory cases, when water hits, rubber products should definitely be dried.

Rubber based on TK, SKB, SKS, SKI and other rubbers very significantly changes its properties under the influence of petroleum products. These rubbers and the raw rubbers based on them are easily soluble in gasoline as described above, this property of which is used in the preparation of rubber adhesives. Vulcanization of rubbers prevents them from melting under the influence of petroleum products, but rubbers retain the property of swelling under the influence of gasoline, diesel fuel, oils and other liquid organic compounds. As a result of prolonged exposure of rubber products to petroleum products, their volume increases, the strength, elasticity and hardness are reduced. Therefore, it is necessary to save rubber from the effects of fuel, oil and other surkov materials. In cases where petroleum products accidentally get into the rubber, it should be cleaned by wiping it quickly.

Materials for repairing car tires. Cars that will be launched at remote distances must be provided with a special apothecary with the necessary materials and devices inside. For cars, the following types of Apothecaries are produced: arc - for repairing the camera; ARSh - for pokryshka and cameras; ARB - for camera-free tires of passenger cars. Inside each aptechka there will be a set of patches (plasters) of rubber in the form of a round and right-angle vulcanized of different sizes, 50 g of rubber glue, which it vulcanizes itself, a metal scraper and polishing paper for cleaning the damaged part of the chamber, a roller (for pressing over) to attach plasticine to the damaged part of the chamber, The ARSh apothecary also has two patches of vulcanized rubber-cord plasticine trimmed in four layers, a chefer tape for repairing pokryshka boards, a device for laying six griboks of different sizes and griboks for repairing perforated pokryshka. In the ARB apothecary, there will be no plasters for repairing the carcass of pokrishkas, unlike the ARSh apothecary. They are replaced by a syringe with rubber paste, a set of plugs, and a device to place them inside the tire when repairing a hole in the chamber without removing the tires from the dam.

In the absence of an apothecary, it is recommended to have the following in the car: rubber glue (preferably on an aluminum bottom); non-vulcanized camera rubber (200-300 mm piece) with a thickness of 2 mm with a protective layer made of cellophane; an old camera piece (200-300 mm) for patching; 2-4 layers of 2-3 cuffs (250-400 mm); rashpil or metal brush; spare zolotnik and caps; tal K powder for spraying on cameras when assembling tires.

The main processes in the production of rubber. Many rubber products, regardless of the complexity of their construction, are usually made according to the general technology, that is, semi-factory preparation; produced by vulcanization.

Semi-finished products are prepared in parallel pots; these consist in the preparation of rubber and ingredients, weighing, mixing.

Some technological operations are carried out in mechanized pots or according to an automated scheme. General technological production consists of the following processes:

- acceptance of raw materials and its storage;
- preparation and processing of rubber and ingredients;
- extraction of raw materials and their dosage (rationing);

- mixing rubber mixture;
- forming rubber mixture;
- kalandrash, rubber coating using calandr on fabrics;
- syringing;
- tailoring rubber zagotovkas and fabrics;
- preparation of rubber glue and weaving of fabrics with the addition of rubber;
- assembling complex items;
- vulcanizing the rubber mixture.

Rubber production plants are equipped with heavy equipment and require a large amount of electrical energy, heat, hydraulic energy. Therefore, it is necessary to organize production in such a way that operating costs come to a minimum.

Plasticizing rubbers. When making a rubber product, natural and synthetic rubbers have always been in demand for the properties of plastoelasticity.

The elastic property of rubbers is very important for rubber products, but this indicator plays a negative role in the preparation of the rubber mixture, that is, in processing, since the productivity of the spent mechanical strength is reduced due to reversible deformation. Under the influence of mechanical and heat, the plasticity of rubber can increase.

As a result of the technological process and this phenomenon, an increase in the plasticity of rubber, a decrease in viscosity and a restoration of its elasticity (elasticheskoe vostanovlenie) are called plasticity. Therefore, the preparation of the rubber mixture requires the use of an indicator that the rubbers have a pronounced plastic property.

Preparation of rubber mixture (mixture). As previously said, the rubber mixture is a complex multi-component system, and its composition includes rubber and various ingredients, which will be evenly distributed in the rubber mass. To obtain a rubber mixture, rubber and ingredients are mixed until a homogeneous mixture is formed.

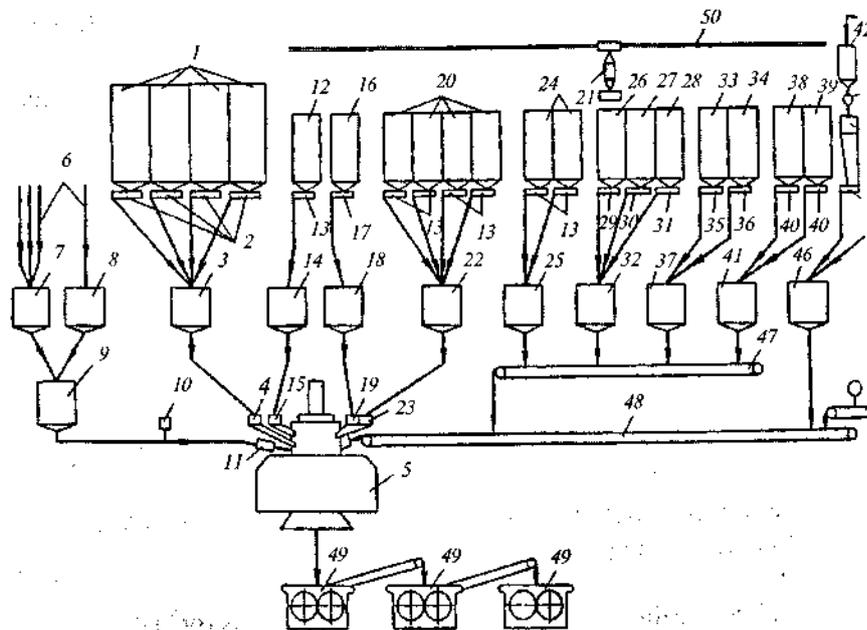


Figure 10. Technological scheme for the preparation of rubber mixture

1, 12, 16, 20, 24, 26, 27, 28, 33, 34, 38, 39, 44 - distribution bunkers for different materials; 3, 7, 22, 25, 32, 37, 41, 46 — automatic scales for Ingredients; 5-rubber mixer; 6 — circulation system; 10 — shesterny pump; 13, 17 - vibrating Auger supply; 35, 36, 40, 45 — screw supply; 42 - container for rubber in granule position; 49 — valves.

The mixing process can consist of several stages:

- crushing solid components;
- introduction of components into rubber;
- dispersing agglomerates;
- mixing.

The component mixing mechanism can be viewed as deformation of the multi-component system. This is due to the fact that as a result of deformation, the thickness of the mixing materials is increasingly reduced, which leads to an increase in the effect of the inter-component surface. As a result, it can be achieved that the layer thickness of the dispersing phase approaches the particle size.

The quality of the rubber mixture is determined by the uniform distribution of the components in volume.

The preparation of the rubber mixture is shown in Figure 10.

Forming a rubber mixture. To obtain a rubber item, it is necessary to give the rubber mixture a clear shape, that is, to form (fig)

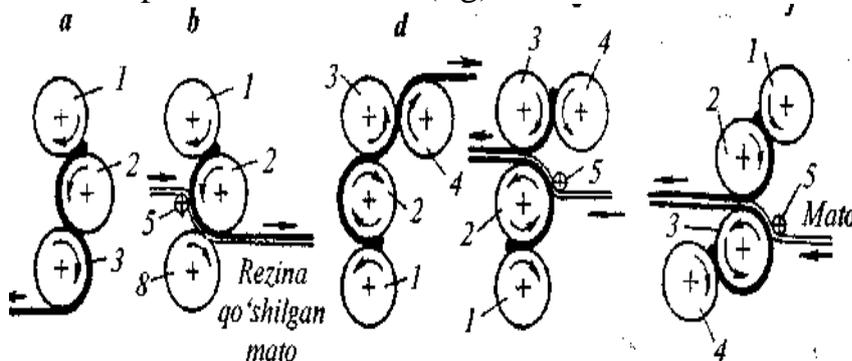


Figure 11. Vulcanizing rubber products

The formation is carried out mainly by methods of: calendering, extrusion (syringe), pressing, pressure injection. In the manufacture of rubber, most often the formation process is accompanied by a vulcanization process.

Control questions

1. Explain the technological, physico-chemical and physico-mechanical properties of rubber and rubber.
2. What are the ingredients of the rubber mixture and their functions?
3. What is the role of vulcanization in obtaining rubber, explain.
4. Why does rubber belong to the category of highly elastic materials?
5. What substances are used to protect against wear and tear in the preparation of rubber?
6. What function does sulfur perform in a rubber mixture?
7. What rubbers are referred to as specially applied rubbers?

Module 5. Varnish-paint materials and coatings based on them

Plan:

1. General information about varnish-paint materials.
2. Varnish-to form a paint coating.
3. Varnish-marking of paint materials and coatings based on them.
4. Main varnish-paint materials.
5. Varnish-indicators characterizing the quality of paint materials.
6. *Safety measures when using varnish-paint materials.*

General information about varnish-paint materials. Varnish-paint coatings not only protect fabrics from corrosion, but also protect wood from rotting and moisture, improving their appearance. More than 85 percent of cars, agricultural machinery and various technological equipment are painted with varnish and paints. In addition, painted items will have electrical insulation and heat preservation properties.

Varnish-paint materials serve to cover the surfaces of the details with a thin layer of film. This is referred to as a varnish-paint layer when the layer is treated as necessary. The varnish-paint layer also serves to protect objects and structures such as other types of mirrors and metal coatings from the effects of the external environment and give them an appearance. In the automotive industry, they are used in order to protect metals from corrosion, wood from rotting, as well as to visually improve their appearance.

The formed layers must meet the requirements imposed on them and meet the following requirements for long-term operation:

- must be firmly connected to the surface to be painted, that is, have high adgesia properties;
- having a sufficiently high strength, hardness and necessary elasticity. As a result of deformation, which occurs under the influence of mechanical or temperature in cases of insufficient elasticity, cracks and cracks appear on the coating;
- moisture, liquid and gas vapor, at the level of capacity, tranemit little sunlight and do not lose their properties when exposed to them. The resistance of the coating to the effects of water and its vapor, air and sunlight is called resistance to atmospheric influences;
- easy recovery of the coating in case of damage to it in the conditions of the autocorrect;
- that it can be used in bulk and be cheap.

The Varnish-paint materials available at the moment do not fully meet all of the requirements listed above. For these and other reasons, in most cases, the coating is made multi-layered. Each layer that forms the coating must meet one or more requirements.

Varnish-to form a paint coating. Before painting, the surfaces are cleaned of dust, impurities, rust, flue residues that are characteristic when welding, oil products, oil stains, old coating residues.

For these purposes, a large number of mechanical, chemical, electrochemical, thermal, ultrasonic and other methods are used. The sequence of simple operations of preparing details for painting, which can be applied at a motor vehicle Enterprise, includes: degreasing the surface using solvents; removing rusty surfaces using a metal brush and a polishing grout. The first layer of coating is given a grunt to the surface prepared to form a varnish-paint coating. Gruntovks serve for a good alignment of logs or enamels, they act as a binding layer between the surface to be painted (metal, wood) and the varnish-paint coatings. Grunt rods perform an important function in the varnish-paint coating, that is, they protect the metal from corrosion due to the high resistance of the coating. The material from which Gruntovka - grunt is formed is usually made by a cyst, a paint sprayer device or immersion. It is advisable that the time between preparing the surface for painting and grunting is very short, since at this time dust can sit on the surface, or the surface may rust. When dried, the grunt will have a not very large thickness (15-20 μm). The rubbed strips on the Gruntovka surface, the resulting petals are kept full. When preparing the details, they should not be allowed to have streaks and various unevenness on the surface, while the existing ones are eliminated by mechanical processing. It also uses local and general putty if it is not possible. Local putty is given to eliminate large unevenness on the surface. The general putty is given for the purpose of grinding the entire surface to be painted. In domestic putty, a dark paste (putty) is used, which contains 75-80 percent filler (chalk, ocher, etc.). Once applied, the thickness should not exceed 0.5 mm, taking into account the insufficient elasticity when drying, the appearance of cracked bumps and cracks. Each layer of putty (there are no more than two of them) is thoroughly dried and polished using coarse abrasive polishing pads (N 80-120) and cleaned of dust and abrasive powders.

When leveling the overall surface to be painted as needed, the surface is given a general putty with a thickness of 50-100 μm , and after drying it is polished with small-grain n 150-220 sandpaper. A common putty is given using a paint sprayer device.

A treated putty, and in the absence of it, several layers of paint are applied to the grunt surface. The number of layers of paint is selected based on the appearance of the layer and the operating conditions and other conditions.

Paint is given to the surface by a brush such as a grunt, a sprayer, including an electrostatic field, immersion, casting and other methods. Each layer of paint is dried separately, the outer layer is additionally polished, polished, localized, etc.

The body cover of the new cars will consist of grunt, Mahali and common spacers and 3 to 7 layers of paint. In terms of appearance, they must comply with the requirements of Class 1 (1054-82), that is, the surface should be smooth, uniform in color and not have other defects. When painting the bodies of Yk cars, gruntovka, local putty and 2-3 layers of paint are given. The layer must comply with the requirements of Class 2 (it is allowed to have small spots, streaks, etc. on flat, smooth surfaces).

Cars ram, oil products Taras, pipe conductors, etc. are painted based on the requirements of Class 3 and 4. The 3rd and 4th class coating will consist of 1-2 layers of paint (in some cases without grunt) and will protect the metal from

corrosion, wood from rotting. In this case, it is allowed to have unevenness, noticeable defects (not affecting the protective property of the coating).

The main components of varnish-paint materials are varnish, grunt, putty, paint and film-forming. Film-forming substances perform the function performed on rubber in varnish and paints, and the binding substance on plastic.

There are those that form a liquid (cotton, sunflower and other oils) and a solid (various sorts of oil) film.

The solution of the film-forming agent in the corresponding solvent is called Varnish.

According to the type of film-forming, two types of paints are obtained:

Alif + pigment ® oil paint

Varnish + pigment ® enamel paint.

As a Pigment, powders of metal oxides (iron, chard, zinc, titanium, etc.), Well-ground natural inorganic substances (chalk, oxk) and aluminum powder are relatively often used. The main function of the pigment is to give color to the paint.

Varnish-in addition to film-forming, solvents and pigments to reduce viscosity, plasticizers are added to the composition of the paint materials to increase the elasticity of the coating, and cycative (catalysts) are added to ensure that the paint dries faster.

Varnish-marking of paint materials and coatings based on them. In our country, Varnish-paint materials are branded according to the state standard 825-73, and coplams based on them are branded according to the State Standard No. 9.032-74.

According to the state standard No. 9825-73, when marking Varnishes, gruntovks, putty and paints, 5 groups of characters are used, which are read from left to right:

Group 1 includes one of the following words: Varnish, gruntovka, shpatlyovka, enamel.

Group 2 will show the main film-forming ones, represented by 2 harfs.

The main film-forming agents are defined as:

Epoxy-ethersEF	Melted oil..... MA
BitomsBT	PolyvinylacetylyVL
GlyphsGF	Paliacril Tar sapalimers AS
PentaphthalsPF	Melamine ML
PaliefirsPE	MochevinaliMCH
PhenalliFL	Epoxidized EP
Perchlorvinilli XV	Alqid-stiralliMS
PaliacrilliAK	Silicon inorganic Ka
Nitrocellulose ...NTS	YantarliYAN
Ganifalli GF	
ShellagliSHL	

The group 3 mark, which comes after the line after the group 2 mark, determines the conditions under which the coating will be used.

The use of varnish-paint materials according to the task:

Gruntovka and Varnishes 0

Spacers 00

Resistant to atmospheric influences 1

Resistance to atmospheric influences is limited (under the canopy, it is recommended to use in the room) 2

Conservation 3

Water resistant 4

Special 5 for external coating of leather, rubber, materials

Resistant to oil and gasoline 6

Resistant to chemical effects 7

Heat-resistant (from 600 C to 5000 C) 8

Electroisolation 9

The symbol represented by the number 1.2 or 3 in the 4th sign indicates the order name given to this varnish-paint material, and there will be a dash between the 3rd sign and the 4th sign, or there will be no interruption.

The 5th Group Icon will show the color of the paint.

For example: glifital tar-based gruntovka-gruntovka GF - 020, nitroVarnish-based shpatlyovka-shpatlyovka NÖ-008. Protective nitroemalu-enamel NÖ-11-15 protective-bluish to form an external coating. Brown oil paint resistant to atmospheric influences-paint MA-11 is marked in the form of Brown.

Removable coatings based on varnish materials are determined on the basis of the following elements, which are placed from left to right:

- marking of the main material of the coating (according to the state standard 9825-73);

- coating class by appearance (denoted by Roman number from I to VII);

- operating conditions of the coating.

By operating conditions, coatings are divided into the following groups:

P-resistant inside the room (used in interior painting of cars), a - resistant to atmospheric influences (used in painting external surfaces of Cars), t-resistant to thermal effects (equipment of thermal cexes is painted), E-electroisolating (electrical equipment is painted), X-resistant to chemical influences (equipment of battery repair plots is painted), X - resistant to the action of acids, - resistant to the effects of gasoline (fuel tanks, fuel injection equipment are painted), M - oil and consistency surkov materials.

For example, a red coating with melaminoalkid resistant to oil action is branded as follows: enamel ML-12-90, Red, II, M.

Main varnish-paint materials. Oil paints are obtained by adding dry dyes and fillers to natural and artificial toffee. When using dark paints, they are diluted to the desired viscosity by adding up to 20-50 percent olif to them. In later times, a small amount (5-10 %) of white spirit or turpentine is added to them in order to reduce the viscosity of paints and reduce their price.

Oil paints are usually sprayed (or applied) on surfaces in two layers, in most cases the first layer acts as a grunt after drying. The coating formed on the basis of oil paints has a high adhesion property, good resistance to atmospheric influences, high

elasticity and insoluble under the influence of petroleum products. Therefore, oil paints have a number of disadvantages, including: the resulting coating does not shine sufficiently after drying and even after polishing, a lot of time (24-48 hours) is spent on drying the coating: the chemical consistency is not high and wears out quickly.

Therefore, oil paints are not used in pure form when painting cars. In motor transport enterprises, curtain-forming agents in the composition of paints applied to the restoration of coatings are in the form of a mixture, for example, a mixture of alif (vegetable oil) and Solid Curtain-forming (tar) is used.

Paints based on a mixture of solid and mixed curtain makers. Varnish-paint materials based on Solid Curtain-forming materials are widely used. The sentence of such materials includes varnishes, grounders, putty and enamel paints. The assortment of these materials is much more diverse. Therefore, below we will dwell only on the main types of grontovks, putty and enamel paints that are used when painting cars.

Nitroemals. The main curtain-forming agent of nitroemals is nitrocellulose (complex Ether of cellulose and nitric acid). By dissolving them in solvents, nitroxellulose Varnishi or nitroVarnish for short are obtained. As a solvent, mixtures of ketones, ethers, alcohols, benzene and their derivatives are used. As such multi-component solvents, solvents numbered 646, 647, 648 are used.

A mixture of NitroVarnish and pigment is referred to as nitroemallic dye. Coatings formed on the basis of nitroemals have a number of advantages, including: they dry quickly even at room temperature; after polishing, they endure the effects of petroleum products for a long time.

Therefore, nitroemals also have a number of disadvantages, including: the mechanical strength of the coatings is insufficient (so much time is spent polishing and polishing them); nitroemal-based coatings are resistant to the effects of temperatures up to 750 C and can erode and burn on their own when heated to 1400 C; nitroemals are poorly absorbed into the metal, so they are

Since the enamel has a low content of a hard substance that forms a veil, the thickness of the veil does not exceed 0.01 mm, for this reason the enamels are applied in 4-6 layers.

To eliminate the above-mentioned disadvantages of nitroemals, in addition to the main curtain-forming agent, additional curtain-forming (modifiers) are added to their composition. On the basis of this method, all current modern nitroemals are produced, including nitroemals of the NTS-11 type, which are used when painting cars.

Nitroemals are included in the sentence of very common dyes. nitroemals were used to paint the body, wings and cabs of passenger cars. In subsequent years, synthetic (including alkyd Tar) curtain-forming dyes are used for these purposes. However, nitroemals are still widely used in car repairs.

Alkyd tar-based varnish-paint materials. As a curtain-forming agent from such paints, alkyd resins are used (alkyd resins are products of polycondensation of multi-base acids in polyatomic alcohols). The most important of such curtain-forming agents are glyphthal (a solution of two-base phthalate acid in glycerin) and pentaphthalate (a solution of pentaeritrite in four-atom alcohol).

When dissolving alkyd Tar, hydrocarbon solvents in the form of turpentine, white-spirit and solvent (a mixture of aromatic hydrocarbons that are released when driving away Tashkent tar) are used. Solutions of Gliftalli and pentaftalli tar are referred to as gliftalli and pentaftalli Varnishes. Gruntovkas (GF-020, GF-073, GF-089), gruntli-putty (GF-018), putty (GF-075, PF-002) and enamels (GF-571, etc.) are obtained by adding pigment, filler and other components to them.

Glyphtal and pentaftal coatings (with the help of such paints, three layers of paint should be given to form a first-class coating, with the help of nitroemal, 5-7 layers of paint should be given to form such a coating) have a high adhesion property, high resistance to atmospheric influences, great strength, sufficient degree of elasticity, the ability to give

To form coatings with the above properties, a layer of pentaphthalic paint should be dried at temperatures of 80°C and above, and glyphtalic paint-at temperatures of 100°C and above. The quality of the coating that is formed when dried at room temperature is relatively low.

Varnish-paint materials based on mixtures of curtain-forming. The properties of oil and enamel paints indicate that paints that form only one veil in their composition will have a drawback in one or another of their properties. Therefore, in the production of varnish-paint materials, mixtures (modifiers) of curtain-forming agents are used. Alkyd tar from above is a fairly common modifier derivative. For example, glyphtal tar is added to the enamels to improve the adhesion property, elasticity and gloss of the coating. On the basis of such a modifier, nitroglycephalic enamel is obtained, which is characteristic of pure nitroemal in terms of the speed of construction, and in terms of the properties of the coating-specific to glyphtal.

The sentence of enamels based on mixtures of curtain-forming agents also includes melaminalkid enamels of the ML-12 type. Melaminalkid enamels are used when painting car bodies, wings and cabins. They will consist of a suspension of pigments in a mixture of alkyd and melaminformal Degid Tar. Solvent or special solvents (No. 651, etc.) are used to ensure the viscosity of melaminalkid enamels at the required level. To form high-quality coatings based on melaminalkid enamels, they must be dried at high temperatures (120-140°C). They allow you to get an elastic, hard coating that glitters well without polishing, resistant to the effects of water and petroleum products. Enamels of the ML-12 type are produced in about 100 different colors.

In addition to paints of the ML-12 type, paints based on mixtures of other types of curtain-forming agents are also used in the automotive industry. The sentence of such paints includes: melaminalkid gruntovkas GF-017 (used when painting trims and details with a phosphated surface); ML-152 enamel (used when painting cabins and wings of cargo cars); ML-197 and ML-1100 enamels (used when painting body, wings and trims of light cars); mochevina-alkyd enamels MCh-123 (used in painting car rams, wheel discs, radiators and other details); MCh-145 (used in painting metal and board platforms of cargo cars); phenolformal degid-alkyd enamel FL-787 (used in painting internal surfaces of fuel tanks); alkyd-styrene putty MS-006, enamel MS-17 (used in engine painting) and others.

Table 5.1. Varnish-the mode of drying of paint materials, the area of application and the main characteristics

Rename	drying mode		Scope of Use and main features
	Temperature °C	duration of drying, hours	
Moyli-Varnishli KF	20 60	24...30	Elastic, resistant to atmospheric influences. Used in painting details, tools, cars and decorative painting of metal and wooden surfaces (rama, chassis, car platform, engine details)
Bitoms BT	20	20...24	Resistant to moisture and chemical effects. It is used in the preparation of electrical equipment and anti-noise sealants.
Pentaftalli PF	20 100	24...284	It has good elasticity, resistant to mechanical influences and atmospheric influences, shiny.
Gliftalli GF	20 100	24...361	Characteristics like PF niki, only the resistance to atmospheric influences is low. It is used to form a protective and decorative layer on equipment and machines. Used in painting car and tractor details.
Melaminalkidli MYO	110...140	1,5	Very firm, elastic and resistant to atmospheric influences
Mochevinali MCH	120...140	1,0	Very hard, resistant to the action of oil and gasoline, shiny like a mirror. Used in painting metal and oil.
Fenolli FL	20 180	24...30 0,5	Very firm, elastic and resistant to atmospheric influences. Used in painting metals.
Epoksidli EP	20 120...180	25 1...2	Very hard, resistant to atmospheric, oil, gasoline, water and chemical influences. durability-stored at temperatures from 60o C to + 200o C. Resistant to thermal effects.
Nitrotsellyulozali NÖ	20	0,5	Resistant to oil, gasoline and chemical influences. It does not have the risk of getting grass and exploding. Used in painting metals and wood. Used when painting engines
Perxorvinilli XV	20 60	1...3 0,5	Resistant to atmospheric and chemical influences. Resistance to thermal effects is low.

Extruded polystyrene	20	2	Very tight. Resistant to the effects of moisture, oil and gasoline. Used in the painting of automobile and tractor engines.
Rubbers	150...180	1	Very tough, elastic, resistant to the effects of oil and gasoline. Used in the painting of mechanical equipment.
Silicon inorganic	20 150	24 2	High resistance to thermal effects (250...500o C), resistant to the effects of oil and gasoline.
Paliacrilli AK,	20 30	24 2	It has high resistance to the effects of water, oil and gasoline.
Polivinilatse stable	12 0	4	it is used when painting items made of steel and aluminum alloys that work at high temperatures in a fuel and oil environment. Resistant to the effects of water, oil and gasoline.

Table 5.2. Classification and field of application of varnish-paint materials

Name of the Material	Designation	Brand	Solvent	Gruntovka	Area of use
Melamin-alkidli	ML	12, 152, 197, 1110, 1195, 1198	651, R-197, R-198, ksilol, solvent,	GF-020 GF-073	Body and cabs, radiator, rama, wheel discs
Nitro-Emali	NI	021, 625,273	646,647, RDV	GF-020 NÖ-081	On engines
		230,507, 508,907, 908, 909, 910,938	646,647, RDV	GF-020 NÖ-081	
Nitropentaftalli	NPF	NPF-10	646, 649	GF-020	
Nitrogliftalli	FA	517,518, 519,521, 522 sp, 531sp,535 sp	646, 649	Gf-020 FYO-03k NÖ-081	
Perxlorvinilili	XF	XF-113	R-4, solvent	FYO-03k	Cabs,hoods, chassis, aggregates, cargo cars
Alkid-			Solvent,	GF-020	on wooden platforms

stirolli	MS	MS-17	Ksilol		
Gliftalli	GF	GF-230	Uaytspirit	GF-020	Cabs,hoods, chassis, aggregates, cargo cars
Moyli	MA	1433,124,1 22	Solvent, spirit, skipidar	GF-020	Rama, chassis, trancmission, on metal and wooden platforms of cars, wheels
Bituminous	BT	BT-123, BT-538, 530, 577	Solüvent, spirit, skipidar		
		Kislotaga chidamli BT-783	Solvent, uaytspirit, skipidar	GF-020	Surfaces that are touched by the vapor of the battery acid
Fenolli	FL	FL-724-1 FL-687	Etil spirt	GF-020 FL-03k	Oil products and water tanks
Polivenilats etatli	VL	VL-515	R-60, etil spirt va etil tsellyuloza aralashmasi		Oil products and water tanks
Silicon- organic	KR	KÎ-97, KÎ-811	Toluol, R-5 Ksilol		Work at high temperatures-in taste aggregates

Perchlorvinyl and acrylic enamels obtained from thermoplastic resins are widely used in painting metals, wood, concrete. The resulting curtains do not burn, are resistant to the effects of moisture, are able to work even in those conditions when oil products touch. Perchlorvinyl enamels dry at room temperature for 2-3 hours. Enamels obtained on the basis of acrylic resins have good mechanical properties. If they are applied over the epoxy gruntovka, the coating is kept in a fit state for up to 6 years.

Most Varnish-dye materials are obtained on the basis of epoxide resins, thermorreactive resins such as Bakelite Varnishi. They are different fillers most often plasticizer enamels can work even at temperatures up to 200-3000s. Many of them can dry out cold (at room temperature). If the coating is heated to a temperature of 110-140 0C and dried, its properties will improve.

On the basis of Silicon inorganic resins, heat-resistant paints are produced.

The abundance of manufactured varnishes, brands of paints and the lack of uniformity in their designation create minor difficulties. In each concrete case, it is necessary to adhere to the recommendations given for this material. information on the main varnish-paint materials used in the painting of passenger cars and freight cars is presented in tables 4.1 and 4.2.

Gruntovka. Gruntovka consists of a coloring substance (50-70 %) and a mixture of filler oil or synthetic varnish. The main requirement for grontovks is that they should penetrate into the pores of the materials to be painted and become firmly

entangled with the surface (information about gruntovks is presented in Table 4.3). To do this, the gruntovka must have the same composition, consisting of a coloring substance and very small particles of filler. Before use, it is diluted with a solvent so that the gruntovka reduces its viscosity. Lead and zinc white enamel, iron Suri and other materials are used as coloring agents. The lead flock slows down the development of electrochemical corrosion by forming a protective veil on the metal surface. When using a gruntovka made on the basis of zinc white enamel, the metal does not corrode, since the zinc, which is more active in the first place, is eroded.

For metal surfaces, it is recommended to use gliftalli and phenol GF-073, GF-089, FL-03k gruntovkas, for wooden surfaces, water emulsion PF-099, FL-093, wow-0150 gruntovkas. In most cases, GF-020 grunt is used when painting cars. EF-083 epoxy grout has good properties.

Table 5.3. Grunts drying mode and application area

Grunt	drying mode		Field of use
	Temperature, °C	duration of drying, hours	
Vinilxlorid sopolomeri: XS-010 XS-059	20	1,0	It is used to form coatings on the surface of products made of ferrous metal, copper and its alloys that are resistant to the effects of chemical, oil and gasoline.
	20	24	Products made from ferrous metals, aluminum and its alloys are used to form coatings on the surface that are resistant to chemical and atmospheric influences.
Gliftalli, GF-0019	20 100	12 0,5	Products made of ferrous metals, copper and its alloys are used to ensure their surface anti-corrosion resistance
Fenolüfor- malüdegidli FL-03	20 100...175	12 0,25...0,5	Products made of ferrous metals, copper and its alloys are used to ensure that their surface has high anti-corrosion resistance
Moyli KF-030 FL-086	20 80	40 4	Products made of aluminum and its alloys are used to form coatings on the surface that are resistant to atmospheric influences.
	20 80	5 2	
Alkidlistirolli MS-015	20	2	Products made of ferrous metals, which are used in heating, are used to form coatings on the surface.
Pentaftalli PF-020	100	0,5	Products made of ferrous metals and wood are used to form coatings on the surface that are resistant to atmospheric influences.
Akrilli AK-070	20	1,0	Products made of aluminum and magnesium alloys are used to form coatings on the

			surface.
Palivinil-butyralli VL-2	20	0,25	Products made of black and colored metal are used to form coatings on the surface that are resistant to atmospheric influences.
Epoxidized EP-09T	150	1,0	Products made of black and colored metal are used to form coatings on the surface that are resistant to atmospheric influences.
Melaminformaludegidli EF-083	150	0,3	Products made of ferrous metals are used to form coatings on the surface that are resistant to the effects of oil and gasoline.

Phosphating VL-02, VL-08, VL-023 grontovkas, which contain phosphoric acid, have only one advantage. When they are applied to a metal surface, an anti-corrosion phosphate veil is formed. It is necessary to apply grontovkas such as GF-020, FL-63k over phosphating grontovkas.

Grunt tools are applied by spraying, using a brush, or by immersion. Gruntovka is rubbed to a thickness of 15-20 μm . After grunting, the treated item must be thoroughly dried.

Shpatlyovka. Putty is made by adding a large amount of pigment and filler (usually chalk) to the varnish (in an amount of 400 percent compared to the mass of the curtain-forming substance).

Table 5.4. The mode and area of application of the putty drying

Shpatlyovka	drying mode		Field of use
	Temperature °C	duration of drying, hours	
Perxlorvinil: XV-005 XV-004	20 60	2,5 1.0	In the case of general and local coverage. Used in domestic putty.
Pentaftalli PF-002	20	24	Used in general and local putty.
Moyli KF-003	100	1,0	It is used in general and domestic putty when forming a coating on heated surfaces.
Nitrotsellyuloz ali NL-007	20	1,0	Used in the correction of minor defects.
Alkidlistirolli MS-006	20	0,25	Used in the correction of minor defects.
Epoksidli: EP-0010	20	24	It is used to form a chemically stable coating on defective surfaces with a depth of up to 2 mm (up to 5 mm with filler).
EP-0020	20	24	Used in straightening surfaces bent up to 5

			mm.
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For processing on the outer surfaces of cars, pentaftalli (PF-002), polyephril (PE-0044), epoxy (EP-0010) and other putty are produced (information on Putty is presented in Table 4.4). A putty applied to metals can be made from lead or zinc Belil, and for wood-from chalk, alif, carpentry glue.

Since putty consists of a poured paste, the total thickness of the putty layer should not be more than 2 mm, and the thickness of the once applied layer should not be more than 0.5 mm so that it does not crack and crumble when drying. A putty is applied to the surface of the grunted surface, first to the surface of it-the Earth, and then to the entire surface as a whole. The total number of layers should not exceed four, the previous one should be dried before applying the next layer. After drying, each layer of putty is polished with a coarse (80-120 Nomer) polishing paper. The outer layer is then moistened with water or solvent and polished with a fine polishing paper or pumice with a water-resistant 150-180 Nomer. The surface is polished by hand or with special machines, and then dusted with a rag, brush or vacuum cleaner. Solvents. As a solvent, butyl and ethyl alcohols, solvent, toluene, acetone, xylol, whitespirite (a narrow fraction of gasoline with 165-200 oC) and their mixtures are used. In addition to these, depending on the type of curtain-forming substance, R-4, R-5, 648, 646, 647,651, RDV, RE-1, R-40 and other liquids that are released in industry can be used. All these are solutions containing various amounts of ethyl, butyl alcohol, acetone, xylol and other substances.

When repairing perfectly, it is necessary to remove the old paint before applying a new coating. For this, various solvents and washing liquids are used. The effect of the ATF-1 Liquid is strong and decomposes the paints within 20 minutes. This liquid can be prepared on the workplace itself. This will require solvents such as acetone, alcohol, toluene, turpentine. in boiling water, liquids heated to 30-40 oS are used.

To remove rust, most agents with organic fillers containing acids are recommended. In industry, a composition of 1120 namers is produced, which contains orthophosphoric acid, ethyl and butyl alcohols, hydroquinone. The acid will dissolve the rust and form a phosphate veil on the surface. This curtain prevents the metal from eroding. The composition is applied with a brush or paint sprayer and washed off after 2-4 minutes. After that, the treated surface is dried, and the acid residues are neutralized with a liquid with 107 nozzles (a solution of ethyl alcohol with ammonia in water).

If there is no ready-made composition for removing rust, it can be prepared. To do this, put 40-50 g of potato starch and so much water in a glass jar, and the mass is thoroughly mixed. Gradually pour 100 ml of concentrated sulfuric acid while stirring the resulting mixture. The paste is poured and passed to a clear state. The contents are applied with a brush to the surface to be treated and removed after 2-3 minutes. The purified metal surface is neutralized with a weak alkali, for example, a 3 percent solution of drinking soda, and wiped until dry.

All rust removal agents contain toxic substances. Therefore, it is necessary to use them carefully, preferably in the open air, standing on the side where the wind is blowing, wearing a rubber puddle.

The most recent operation to be performed when preparing surfaces for painting is degreasing. For this purpose, white-spirit or gasoline-solvent can be used. The substances contained in detergents remove fat deposits well. A degreaser prepared by adding 1g of caustic soda (corrosive sodium), 5-10 g of calcined soda, 15-25 g of trisodium phosphate, 1 g of liquid glass to 1L of water can be recommended. The use of synthetic detergents MS (MS-6, MS-5) also gives a good result. On a well-degreasing surface, water droplets do not accumulate, but flow off.

A varnish is applied to a pre-prepared surface in 2-3 layers with a paint material, paint sprayer or brush. If a sprayer is used, the paint flow should be directed perpendicular to the surface. The Material is first applied in the way of vertical bands, then in the way of horizontal bands. Only then can an even coating be formed. It is important to remember that it should be larger than the new Polo. Painting should be done inside the room or under the canopy at a temperature not lower than 10°C so that dust and water do not fall.

The varnish-paint forms a tight curtain that does not wet after the coating dries. When all the preparatory operations are performed, the main varnish-paint materials (putty, gruntovka, enamel) are selected correctly and the rules for their application are followed, a coating is obtained that will not remain from the factory after repair. But even when all operations are fully followed, varnish and paints can only serve for a few years. For this reason, cold phosphating solutions with the addition of rust remover inhibitors (inhibitors), which now contain corrosion decongestants, are used to protect materials. They are recommended for processing on surfaces of cars, agricultural machines and various equipment before painting. In addition, inhibitors based on artificial turf were produced. When these agents are used, there is no need to remove rust and degrease the surface before painting. The inhibitor adds 1 and 2 nameplates, such as storage of petroleum products, and removes steel grooves and tanks intended for driving from corrosion. The cost of phosphate paint coatings is 2-3 times cheaper than usual, but it will last 3 times longer.

Varnish-indicators characterizing the quality of paint materials. When assessing the quality of varnish-paint materials, a number of indicators are based on: the ductility, viscosity, independence of the paint, the speed of construction, etc.

The ductility of the paint. The property of making the previous color of this surface invisible when the paint is applied evenly to the same-sex surface, or the difference between the White and black areas on it when they are applied to a black-and-white surface, disappear and the properties of being able to make the surface look all the same color.

In terms of number, however, the ductility of paints is expressed by the amount in grams of paint spent on painting the previous color of the 1 m² surface until it becomes invisible. The ductility of oil paints and enamels suitable for use is usually determined by the method of a sliding window plate or chessboard. In both cases, the ductility of enamels and paints applied with a brush and not yet hardened is determined.

Determination of the ductility of paint using a mirror plate with a path. In this case, a strip-shaped three-way paint is applied to one side of a plate with a thickness of 2...2.5 mm, measuring 100...300 mm, cut from colorless glass, with a length of 250 mm and a width of 15 mm. The second edge of the plate is painted black, and the middle is white. The material being tested on the second side of the plate is applied thinly with a brush. The surface of the plate, placed on top of white paper, is in the form of a strip, the painting is continued until the colors with which the three-way paint is applied remain invisible. If, after the first layer is given, the White and black paths are visible, then the layer is dried for 5 minutes, and the second layer is given paint, and the painting in this way is continued until the White and black striped colors remain invisible. After that, the painted mirror plate is dried at a temperature of 50-600 C for 10 minutes. Before painting and after painting, the plate is weighed and the amount of paint being tested, which is used to seal it, is determined.

Viscosity of paint. Viscosity is considered one of the important properties of varnish-paint materials. It is necessary to correctly determine the viscosity of the paint and ensure that the viscosity is within a certain limit in the process of preparing the paint.

When determining the viscosity of the paint, the VZ-4 viscometer (figure 4.4) is used. The VZ-4 viscometer is made in the form of a plastic cup with a capacity of 100 ml. at the bottom there is a calibrated hole with a diameter of 4 mm, this hole is closed with a steel ball, a wire thread is threaded into the surface of the ball, which protrudes beyond the glass. The viscometer is filled with paint, which must be tested to its upper level. After that, the viscosity of the paint is determined by determining the time it flows out of the glass on a stopwatch. The stopwatch ball is launched at the moment when it is rapidly pulled out of the paint using a curved wire, and the time elapsed until the paint flows completely out of the glass is determined by its viscosity.

The viscosity of the paint at room temperature should be within the following limits: the viscosity of the paint suitable for spraying in special paint spraying devices should be at the limit of 20-30 C, and for paints applied using a brush, at the limit of 30-60 C.

If the time for the paint to flow from the viscometer is less than 20 seconds, the viscosity of the paint will not be enough, so the viscosity property of the paint will be low. When using such paints, the material waste increases. Therefore, before using such Paint, It is necessary to thicken it to the required viscosity by adding undiluted paint.

It is not advisable to use it, even if the time of leakage of paint from the viscometer increases by more than 60 seconds. Because the increased viscosity of the paint from this indicator prevents the acquisition of quality coatings, while deteriorating its concealability property. The formed coatings can crack as early as the time of construction.

Working viscosity of paints is a variety for paints of different brands. For example, 20-22 s for ML-197, 24-28 s for ML-1110, 23-25 s for ML-152, 25-30 s for MCh-123, 20-25 s for MS-17.

The strength of the paint curtain to the bend. The strength of the paint curtain to the Bend allows you to determine in what working conditions the paint can be used. The strength of the varnish-paint curtain to the bend is determined in a tool called the elasticity scale (figure 5.5). In this case, the curtain base should not break (break, crack, crack) and move when wrapped in a sterjen of a certain diameter. The tool is mounted on a plastic base and fixed using screws.

A tin plate with a paint thickness of 0.2...0.3 mm, the consistency of which should be determined, is applied to the plate and dried. After drying (the drying time for nitroVarnishes is 24 hours, for oil paints-72 hours), a strip of 20 mm wide and 100 mm long is cut out of it. Then one of the straps bends around the sterjen with a diameter of 20 mm to 1800 C, making the painted side up. Bending is carried out at room temperature (20 ± 50 C) and for a short time (2...3 C). If there are no visible broken or cracked areas on the curtain surface with the help of a magnifying glass after bending, the bending is continued until the diameter is 15 mm, 10 mm, etc.in sterjens, that is, the paint appears cracks (cracked and layer-by-layer migration) on the curtain surface.

The bending strength of the paint curtain is expressed by the smallest diameter of the sterjan, which is not damaged when bending this varnish-paint curtain. For example, when it is said "elasticity 15", it is understood that the curtain does not change when bent around sterjens with a diameter of more than 15 mm, but in a sterjen with a diameter of 10 mm, it breaks and becomes covered with cracks.

If there are cases when the curtain is struck or moved when bent around a sterjen with a diameter of 20 mm, then the curtain is assessed as "not elastic", that is, fragile.

Determination of the resistance of the curtain to the action of force of gilding is determined by throwing a balloon from above on the painted surface. Usually, the technical condition or standards for each item indicate the durability of the curtain.

The durability of the curtain to the stroke is 10 N from above when freely throwing the load varnish-paint does not cause deformation on the surface of the curtain metal plate.

Safety measures when using varnish - paint materials. When painting car details, the air of the painting region is contaminated with fine particles of paints and vapors of solvents contained in the paint. This results in a district of dyeing material that has a detrimental effect on the organism of workers working in the dyeing region and is fire-hazardous. Therefore, before starting painting work, all workers must be guided by the rules of Technical Safety and fire safety in the painting process.

It is strictly forbidden to carry out cmoking, welding work, as well as other work that is at risk of sparks in rooms where paintwork is prepared and stored.

It is advisable to use closed Taras when storing and transporting varnish-paint materials. The mouth of empty Taras should always be without a berk and kept outside the warehouse of varnish-paint materials, at least 20 m from the production building.

It is strictly forbidden to illuminate Taras with the help of matches when controlling that they are completely freed from varnish-paint materials. Taras are allowed to be repaired only after the obdon from solvent vapors has been cleaned. Aluminum powder should be stored in a damp non-touching room, because when

wet touch of aluminum powder, it can ignite on its own. Oil and varnish-paint materials woven wiping-cleaning materials should be stored in closed metal surfaces and removed outside the room at the end of the work shift.

Rooms and storage facilities for the preparation of painting, varnish-paint materials must be provided with fire-fighting equipment and tools. If the occupied area of the dyeing region is up to 50 m², one OU-2, OU-5 or OU-8 brand uglekislotal fire extinguisher, two foam chemical fire extinguishers, sand filled with sand not smaller than 0.5 m³ should be provided with a green, shovel, cloth, odeal size 1.5-1.5.

Workers working with varnish-paint materials should wear special clothing. In order to protect the respiratory organs from the fog of varnish-paint materials formed when spraying varnish materials with the help of paint-spraying equipment, workers need to be provided with respirators of RMP-62, RU-60 and other types.

In the process of dyeing, IER-1, HIOT-6, PM-1 pastes, IDM soap, biological and protective earplugs are used in the protection of the skin of the hands, since there is a risk of contact of dyes or solvents with the hand.

The biological glove consists of casein (according to 13 percent Mass), a 25 percent solution of ammonia (2 percent), glycerin (13 percent), 96 percent ethyl alcohol (36 percent), distilled water (36 percent), which, when applied to the hand using a brush, forms a protective veil after 30-40 seconds. The protective curtain is resistant to the action of organic solvents, but is easily washed off when washed using soap in hot water.

When varnish-paint materials touch the skin of the hands, it is recommended to clean the skin using pastes such as "Rally", "REM", "Flora".

In the absence of special pastes for cleaning the skin of the hands, it is necessary to thoroughly wipe the skin of the hands on which the paint was applied, first using a soft dry rag, then moisten the rag in a solvent and wipe the parts on which the skin was touched with paint, after which it is necessary to soap and After the hand is wiped dry, it is recommended to apply panoline cream to the hand. When cleaning paints that have touched the skin of the hands, solvents with a high degree of toxicity are used: white-spirit, turpentine (for oil paints), ethyl alcohol, acetone (for paints with epoxy and nitrocellulose). The use of benzene and other toxic solvents is not allowed when cleaning and washing hands.

Persons under the age of 18, pregnant and lactating women are not allowed to work knowledge of varnish-paint materials.

Painting department rooms should be bright, clean and dust-free. Structural elements and fences (walls, ceiling, floor, etc.) of the painting room must be resistant to fire effects. A special tile up to 2.4 m high is attached to the inner surface of the room wall, while the floor is solid, non-combustible and non-slip. It should therefore be made of a material that is easy to clean from impurities. The room temperature should not be lower than 15-160 C, and the specific air humidity should not be more than 60 percent. The room should be heated using low pressure air or water. When heating using water, the temperature of the surface surfaces of heating devices should not be more than 900 C.

In order to improve the working conditions of workers, painting rooms must be provided with suction ventilation.

When lighting a painting plot, natural and artificial lighting is used. The illumination of the painting plot should not be less than 75 lk.

The amount of paint, varnish and solvents applied in the preparation of the paint on the plot should not exceed the daily requirement. The rest of these materials are stored in special storage facilities.

It is forbidden to store and eat food at the dyeing site, paint preparation departments and in the warehouses of Varnish-paint materials.

When working with electrical appliances, you need to be very careful. At break times, the power should be disconnected when the unit is moved from one place to another, as well as when the unit has a slight malfunction. It is forbidden to change or adjust electrical appliances during Operation.

When painting the inside of the bus cabin, its doors, windows and luggage must be open.

According to the "rules and norms of Technical Safety and sanitary production for painting tsexes", the use of nitrocellulose and alkyd materials in a single painting chamber is prohibited. If you notice the need to use one of them after another, first of all the camera should be cleaned of the remnants of the used paint and impurities in the air.

Terms related to pigments and determents. At present, there is only a standard of terms for inorganic pigments and fillers (GOST 19487-74), while the standard of terms for LBM has not been developed. The following are generally accepted terms and definitions of LBM and their components.

LBM is a product that, when applied in a thin layer to the surface of an item, forms a protective or decorative coating.

LBQ-Varnish-a layer of paint forms a forming coating on the surface after it is applied in one or more layers to the surface of the item, it acquires a sufficient degree of adgesia.

A solution of varnish — coating-forming substances (Tar, cellulose ethers, bitums, vegetable oils and fatty acids) in an organic solvent or water, forms a solid, homogeneous and clear (except bitumen varnish) film after it has set (dried).

Semi-finished varnish is in the form of a semi-product and is intended for the production of enamels and other LBM.

Enamel-suspension in Varnish in combination with pigments and fillers of their mixtures, not clear after drying (setting),.forms a solid, various glossy and surface texture film.

Dye-a suspension of pigments and their mixtures together with fillers in a substance that forms an oil, olife, emulsion, latex or other film, forms a non-clear, painted homogeneous film after drying (downy).

In combination with water — dispersion (emulsion) paint-pigments and fillers of their mixtures, synthetic polymers (polyvinylacetate emulsion, butadiene-styrene latex and others.) auxiliary additives in Aqueous Dispersion (emulsifier, stabilizer and b.) suspended suspension forms a dull coating, which is painted after drying.

Gruntovka-in combination with fillers of pigments and their mixtures in film-forming substances (olif, Varnish and B.) suspension, after drying to the base and flammability to the upper layers, forms a good, non-clear, homogeneous film with adhesion.

Putty-the putty consists of pasty mass, pigment, filler and film-forming mixtures, designed to fill the unevenness, depths of the surface being painted.

Olif-a film-forming liquid-a product of processing vegetable oil and fatty alkyd tar with the addition of a cyclative to accelerate drying.

Cycative-in the form of an oxide and in the form of a soapy solution in organic solvents (naphthenate, linoleate, rubberized, etc.) some metals (mainly lead, manganese and cobalt) compounds are added as catalysts to accelerate construction in the preparation and use of LBM.

Solvent is an organic volatile liquid (hydrocarbon, ketene, alcohol, ether, etc.) or a mixture of similar liquids, serving to dissolve the film-forming agent and give the LBM the necessary consistency.

The diluent is an organic volatile liquid, used in order to reduce LBM viscosity and make it suitable for application to surfaces.

Inorganic pigment-natural or synthetic dry, coloring inorganic substance, insoluble in dispersion media and forming LBQ with film-forming.

Organic pigment is a synthetic organic dry-coloring substance (azo-, diazopigments, phthalocyanin, etc.), insoluble in dispersion media, and forms colored enamel and bright (dark) colored, high-quality paint with film-forming.

Filler-dry inorganic substance, insoluble in dispersion Media, low burning and dyeing property, used as an additive to pigments, gives them specific properties in the preparation of non-clear LBM, and pigments are saved.

Plasticizer-organic product, practically does not fly. It is added to the film maker in order to give elasticity to the LBQ.

Module 6. Synthetic adhesives and equipment materials used in vehicles

Plan

1. General information about adhesives
2. Adhesives based on tar.
3. Rubber-based adhesives.
4. Coating materials.
5. Gasket and compacting materials.
6. Electroisolating materials.
7. Wood materials.

The areas in which adhesive compounds are used are regularly expanding. This is due to the fact that they have a number of advantages over welding and other compounds, chunonchi, with which it is possible to attach various materials, in which the mass of the object structure decreases, resistant to atmospheric influences. It is also very simple to the technology of attaching adhesives. It is possible to attach materials, alloys, glass ceramics, plastic, wood and many other materials with adhesives produced in industry. When glue compounds are used,

the cost and labor consumption is greatly reduced, the corrosion resistance of the structure increases, the tension in the compounds decreases.

In the automotive industry, adhesives were originally used only when gluing noise-insulating and salon finishing materials. This mainly used glue and hermetics based on natural rubber and bitumen. And in the 60s of the XX century, phenolic adhesives began to be used when gluing brake pads. As a result of the beginning of the production of modern cars, the use of glue and hermetics in the automotive industry has increased significantly. For the Avotomobil industry, special 15-name adhesives and 10-name hermetics began to be produced. To date, the range of adhesives and hermetics has expanded even more. One of the latest innovations is the use of acrylic adhesives when gluing the rear view mirror, which is installed in the car interior, to the windshield of the car.

Attachment using adhesives has the following advantages:

- it is possible to attach items made of different materials, different in properties, elasticity modulus and thickness; very thin lists can also be attached (the detail may fail due to the high concentration of loading when thin lists are attached in other methods);

- it is possible to make items with complex shapes that cannot be made based on other methods;

- the presence of the possibility of assembling the structure at low cost and with speed, so that at the same time it is possible to attach several elements of the structure;

- the strength of compounds formed on the basis of glue is higher in a number of cases than the strength of compounds formed in other methods, and the cost is lower;

- the load is evenly distributed over the surface in glued joints, the load concentration is minimal;

- the use of adhesive compounds instead of bolted and parchine nail compounds reduces the construction mass.

It is a curtain-forming substance that adheres well to surfaces to be attached when the glue dries. In addition to the main gluing component, the composition of the glue includes stiffeners, hardening accelerators, plasticizers, fillers, solvents (so that it is easy to use). the glue usually passes into a solid state under the influence of stiffeners at high temperatures.

The operating temperature of the adhesive compounds is not so high rarely increases from 3500 C. This is their main drawback. But glue-Cements have been created that can work even at temperatures of 5000C and above. The solvents contained in the glue evaporate when the glue is gone. This results in the penetration of glue and a decrease in the strength of the compounds. Therefore, the properties of the glue with the addition of a solvent that does not evaporate, but reacts with the veil, will be much better. Fillers (quartz dust, porcelain dust, metal oxides) also reduce the penetration of glue and at the same time increase the durability of the curtain, thermal conductivity. When new polymeric materials are used, there will be no defects characteristic of adhesive compounds, and the areas in which they are applied will increase.

According to the type of main substance that forms the veil, all adhesives are divided into natural and synthetic adhesives. Natural Adhesives include animal adhesives (casein, albumin, glutinous adhesives) and plant adhesives (adhesives made on the basis of starch, dextrin, natural rubber, guttapercha). They are little used in the technique.

Adhesives based on tar. Adhesives used in industrial quantities are obtained from thermoplastic or thermosetting synthetic resins. Thermoplastic adhesives are made on the basis of polymers of ethylene, propylene, methylmethacrylate, etc. They are mainly used in compounds where low load falls. Widely distributed thermosetting adhesives (phenolformaldehyde, carbamide, epoxy or other adhesives) are divided into hot and cold-hardening varieties. Cold-hardening adhesives solidify at room temperature. A stiffener is added to them directly before use. When gluing without boiling, a rather solid compound is usually formed, the adhesion process is accelerated. The description of the main varieties of adhesives and the properties of the compounds formed using them are presented in Table 5.1.

Phenolformaldehyde resins-based adhesives. BF-type adhesives, which are obtained on the basis of phenolformaldehyde resins, are much more common. Gluing work is carried out at a temperature of 140-200 C. In this case, the surfaces to be attached are kept under pressure of 0.1-2 MPa (1-200 kg/cm²) for 0.5-1.0 hours. They are used in the connection of metals between themselves and plastics. Since there are a lot of plasticizers in the BF-6 glue, they are used to glue gases, skin among themselves, as well as metals. The viscosity of BF-type adhesives is in the range of 30-60 C. the dry residue that remains after the glue dries is 10-20 percent compared to the mass of the glue. The operating temperature ranges from minus 60 to 600 C. The consistency of the formed compound to shift reaches 12-15 MPa. On the basis of these Tar, more heat-resistant (operating temperature from minus 60 to 3000 C) VS glue is produced. In repair work, they are used to glue and attach the overlays of the frictional pads and bite discs of the brakes (solidifies when heated to 140-1800 C). The viscosity of VS adhesives is 50-120 C, the share of dry residue is 20-30 percent, and the consistency to shift is 17 MPa. BF and VS glue are delivered ready-made. Such adhesives presented in a container can be stored at room temperature for 6-8 months.

In subsequent years, gypsum 11-10 (operating temperature minus 40 to 3300s) is being produced for gluing brake razors to steel bitches, gypsum 11-12 (operating temperature from minus 70 to 2800 C) type phenolformal carbide tar-based adhesives for gluing antifriction gases to metals.

In recent years, phenolformal carbide tar-based adhesives have been supplanted by epoxy and polyurethane adhesives.

Adhesives based on Epoxy Resins. These glues are divided into types that solidify cold and boiling, and on the basis of these glues, compounds are formed, the physical and mechanical properties of which are very good. Compounds formed on the basis of epoxy adhesives become resistant to the effects of water, oil and gasoline. Epoxy adhesives that Harden cold are relatively widely used in car repairs. Epoxy

compositions are produced in a composition that is represented by numbers from 1 to 21. The basis of digital content 4, 13-16 and 19 is Ed-20 tar, while the basis of the rest of the content is Ed-16 Tar. These epoxy compositions contain between 10 percent and 25 percent plasticizer - dibutylphthalate (60 and 50 percent, respectively, in digital compositions 20 and 21). These compositions are prepared by adding 10-12 percent hardener to epoxy resin. Polyethylenpoliamine is used as a hardener. As a filler for epoxy compositions, aluminum powder, crushed mica, graphite, cast iron powder, iron oxide and gas dry are used.

In the production of cars, up-5-207 epoxy glue is widely used, which hardens without boiling. They are used when attaching internal and external panels of doors, hood and trunk ribs. Also, epoxide tar-based adhesives are used in the repair of cracked areas and holes in the cylinder block, in the cylinder head, in the coupling clutch and transmission crankcases, in oil and water radiators, in the fuel tank.

Adhesives that solidify without boiling are prepared by adding 7-10% stiffener to 90-93% epoxy tar at the place of application. It is necessary to use the prepared glue within 1-2 hours, otherwise they will become unusable. The permissible temperature limit for glue compounds is 60-150°C. It takes about a day to form a solid compound using adhesives that solidify at room temperature. Even if they do not press the attached details together (they have enough of their own mass).

Table 6.1. Description and area of application of adhesives

Brand	The basis	Materials to be attached	Highest temperature, °C	Description of compounds
BF-2 BF-4 BF-6 BFR-2	Fenolo-formalüdegid cmola	Metals, solidification-malar, ceramics, plastics, organic glass, wood, gas-llamas, leather, rubber	80 60 200	Resistant to the effects of water, petroleum products, has good electrical insulating properties
VS-10T VS-350	Fenolo-formalüdegid cmola	Alloys, Steels, aluminum nickel, zinc, ceramics, textolite	200 300 (short mud-datga (up to 350°C))	Resistant to the effects of water, petroleum products, has good electrical insulation properties
Öiakrin	Poliefir-akrilat	Desired materials	150	Poor resistance to water and atmospheric influences
VK-3 VK-32 VK-13M FRAM-30	Fenol-kauchuk	Metals, plastics	250-300	Good resistance to the effects of water, petroleum products and solvents
PU-2 VK-5 VK-11	Poliuretan cmola	Metals, plastics, ceramics	200	Resistant to the effects of water and oil products

K-17 M-1, M-70	Urea Tar	Wood	80-100	Low water resistance
VK-15M KT-30 VKT-2 K-30061 (sovuqlayin qotadi)	Silicon-organic compounds	Metals, ceramics, plastics, rubber	250-400	Resistant to the effects of water and petroleum products
BİV-1 KĖI-1 Ė-4 K-153 VK-9 (sovuqlayin qotadi)	Epoxide Tar	Desired materials	100 125	High mechanical strength, resistant to the action of petroleum products, solvents, good electrical ISO-lyating properties
VK-32M Epoksid P, PR (qaynoq holda qotadi)	Epoxide Tar	Desired materials	150	

To improve its mechanical properties, fillers (metal powders, graphite, crushed Mica, talcum powder, etc.) are often added to epoxy resin before adding a stiffener. The amount of filler to be added depends on the type and operating conditions of the Uzel. The consistency of the compounds obtained on the basis of epoxy resins with filler and hardener, which solidify without boiling, will be much higher. The hardening process takes place at a temperature of 120-2000 C for 0,5-4,0 hours.

Polyurethane tar-based adhesives. The adhesion property of polyurethane tar-based adhesives is good and can be used at room temperature and without boiling. hydroxyls of polyephyr and polyisocyanates are used in the preparation of glue. Polyurethane is used to glue tar-based adhesives to metal and non-metallic materials. The formed compounds will have the following properties: resistant to the action of petroleum products, high strength to vibration and impact, resistant to rapid temperature changes.

Polyurethane tar-based adhesives are produced in brands such as Vilad 11k-1, Vilad 13-2m, GPK 24-11, KLM-1, PU-2, VK-5, VK-11. The strength of the compounds formed on the basis of these adhesives in displacement will be in the range of 3-20 MPa. They can be used from minus 60 to 2000s. adhesives can be stored for up to 6 months (some stamps up to 12 months).

Poliefiracrylate adhesives. The bonding properties of polyphyracrylate adhesives (e.g. tsiacrine) are very high, with which any material can be attached. Solidifies in a minute at room temperature. It is used less often than its low water resistance. The properties of gluing adhesives obtained on the basis of phenolkauchuk, which

solidifies without boiling, are good. It solidifies for 1-4 hours at a temperature of 130-200°C and a pressure of 0,5-1,2 MPa (5-12 kg/cm²). Adhesives made on the basis of polyurethane, which solidify at room temperature for 24 hours, and when heated for 4 hours, are used sparingly due to their toxicity.

Adhesives based on Polyvinyl Chloride polymers and copolymers. Polyvinyl chloride is poorly soluble in organic solvents, so they are used in the form of pasty dispersion in a plasticizer called plastizol. In addition to polyvinyl chloride, Plastizol contains stabilizers, fillers, pigments, adjuvant additives and other substances. Adhesives based on Polyvinyl Chloride polymers and copolymers are produced in such brands as D-1A, D-4A, D-7A, GIPK-133, PF-1A. The strength of the compounds formed on the basis of these adhesives in displacement will be in the range of 1.5-10 MPa. They can be used from minus 60 to 130°C. adhesives can be stored for up to 1-3 months. They are used when pouring air elephant track covers, Jipping Weld seams, gluing oil elephant track cardboard elements, anti-corrosion and anti-noise protection. Also on the basis of polyvinyl chloride polymers and copolymers, adhesives such as Mars, Phoenix, MTS-1, PED-B are produced, which are used in car repair. They can be used at temperatures from minus 40 to 800°C. Their shelf life is from 3 months to 1 year. These adhesives are mainly used in the finishing of car salons and cabins.

Adhesives for attaching wooden products. Carbamide adhesives are used to attach wooden objects. The attachment is performed at room temperature (16-24 hours) or slightly heated using fasteners. The details to be attached must be compressed with a pressure of 0.05-0.5 MPa (0.5-5.0 kg/cm²) to each other. Fillers are added to reduce penetration.

Adhesives applied at high temperatures. Adhesives made on the basis of Silicon inorganic compounds are used to form compounds that can work even at high temperatures. They contain adhesives that Harden both hot and cold (cold-hardened adhesives have low heat resistance) compounds formed by glue VK-8, VK-15 can be heated for a short time to 1000-1200°C. In recent years, epoxy adhesives and pastes have become widespread. With them, the desired materials are firmly attached to each other and to another material. They can be attached both cold and hot.

Rubber-based adhesives. Rubber adhesives (VKR-15.16.17, KLM-1.4508, etc.) are used, which coolly Harden rubber when attaching rubber among themselves (for example, when repairing car cameras), as well as rubber to glass, metal, and other materials. They are made by dissolving natural or synthetic rubbers in organic solvents, most often in gasoline "Galosha" (a narrow fraction of gasoline that evaporates by boiling in the range of temperatures 80-120°C). 24 hours is enough for gluing at room temperature. But the strength, heat resistance of the cold-glued joint will be low (60-80°C) (VKR-16,17 of the glue is 150°C). The process of vulcanization without boiling is carried out at a temperature of 140-150°C. In this case, the strength of the removable compounds is often no longer inferior to that of the main material. For a strong adhesion of products made of non-vulcanized rubber to Steels, aluminum, latun, boiling leuconate glue is used. The compound can work at

temperatures up to 1500 C. The finished glue can be stored for 1.5 years. This glue forms an elastic, resistant to the effects of petroleum products.

It is convenient to practically use self-vulcanizing adhesives 88n and 88np (since glue contains vulcanization accelerator and activator, it vulcanizes at room temperature for one day) the resulting compound turns out to be much more solid. If the attachment glue is done by heating it to 500s, the mechanical strength of the attachment will increase even more. Low resistance to the effects of petroleum products is a disadvantage of these adhesives. If heat-resistant rubbers from Silicon inorganic rubber need to be attached to metals, CT-25,CT-30 and other adhesives can be used. These glues are made on the basis of Silicon inorganic Tar, give endurance up to a temperature of 2000 C.

The process of gluing requires a certain degree of preparation of surfaces. To obtain a solid compound, the surfaces must have the same grain size. For this, aluminum, tin, ceramics, porcelain, rubber cardboard are treated with gilding, ferrous metals, hard alloys, some plastics with pitra. Wooden items are cleaned with egov. For some metals and alloys (aluminum, magnesium, copper, chromed products), it is necessary to corrode surfaces in acid or alkaline baths and perform other operations. Items made of polyethylene and some other plastics are treated with a solution of sulfuric acid. Before gluing, the details are degreased with gasoline, acetone, detergents. When repairing glued attached details, it is necessary to scrape off the old glue on them.

Painted surfaces are washed with detergents and rubbed with sandpaper (structures that do not fall strength-ni surfaces) or the paint layer is completely scraped off. Glue to the prepared surface is usually applied with a brush, and in rare cases, glue pastes with a pulverizer or spatula. To mechanize this process, equipment is often used that applies glue. It began to be used to apply glue to volumetric details on an eletrostastic field.

In îdat, the coefficient of linear expansion of the bonding surfaces and the adhesive membrane from heat varies. For this reason, it is necessary to apply the glue to the surface as thin as possible. Only then does the compound come out solid. The thickness of the glue curtain should not exceed 0.25 mm.

The field of use of adhesive tapes has expanded significantly: they are used in the repair of insulation, to protect metals from corrosion, to paint surfaces or to form galuvanic coatings. In addition, they are also used when marking, wrapping items. Tapes are made of paper, cellulose, polyethylene, lavsan, polyvinyl chloride and glue is applied to them. Their advantage is that they adhere well to almost all surfaces, do not require special equipment for gluing. It is taken out ready.

Coating materials. Various coating materials are used in the insulation of passenger cars, bus salons, cargo car cabins from heat and sound to improve the working conditions of drivers. Coating materials should be sufficiently strong, not quickly eroded in the process of Use and retain their appearance for a long time, do not change their properties and appearance under the influence of petroleum products, easy cleaning from impurities (dust, grease and oil residues), be as tasteless and valuable as possible. Natural fabrics such as layering movut, feather velvet, reps, parusina are considered to be most commonly used materials. Now, synthetic

materials such as nylon, Capron, lavsan, which have a number of advantages over natural materials, are in the main place within the coating materials. Their assortment is regularly increasing. In addition, various polotnos are also used, in which synthetic tar is impregnated. For upholstery of salons and armchairs, artificial leather, film materials are used. Sunuiy skins, made on the basis of knitwear or gauze, are called nitro skin, vinyl skin, elastic skin (resistant to the action of petroleum products). Film materials are films that have a dimly flat surface on which the picture is made.

Dermantine (one side covered with a coating in the form of nitroemal), tekstovinite (one side covered with tekstovinite plasticity) and bustim (one side covered with chlorinated plasticity) are widely used when covering the seats and backs of trucks and buses. artificial skins of the type 600-60, 750-30-20E and 450-30-40 (smooth or fluffy drape with polyvinyl chloride coating) are widely used in the decoration of passenger cars.

Polyvinyl chloride film materials for decorating car salons (cabins). These materials are obtained by adding plasticizers, stabilizers and other additives to polyvinyl chloride. They can be used at temperatures from minus 40 to 800 C. They are produced in three different brands:

Type 0.4-used when covering the interior of doors;

Type 0.4 T-used to cover the ceiling of the car interior (cabin) and the sun barrier umbrella;

Type R-used in the manufacture of gaskets for the cooling system. Polyvinyl chloride film materials are produced in the form of a wrapper no less than 40 m. Film materials of type 0.4 and 0.4 T (60-2) do not change their properties even when held for 100 hours at a temperature of 0 C.

The physical and mechanical properties of polyvinyl chloride materials used for processing into the salons (cabins) of cars are presented in Table 6.2.

Table 6.2. Physical and mechanical properties of polyvinyl chloride materials

Dimensions	0,4 type	0,4 type	R type
Width, mm	1270-20	1400-30	1400-20
Thickness, mm	0,42-0,02	0,42-0,02	0,40-0,10
Consistency in interruption, N, at least:			
In the longitudinal direction	343	196	215
In the transverse direction	294	176	196
Relative elongation at the break, %, at least:			
In the longitudinal direction	-	-	120
In the transverse direction	-	-	140
Hardness	-	24,5-44,1	-

Tissue coating materials. tissue materials are widely used to cover the salons of passenger cars and buses, the walls, ceilings, doors, seats and other details of the cabins of freight cars. Due to the fact that the tissue material has high aesthetic and hygienic properties, it is important to ensure the comfort of cars.

Below is the data for comparing the hygienic properties of tissue and artificial coating materials presented in Table 6.3.

Table 6.3. Hygienic properties of tissue and artificial coating materials

	Air travel-thirst, cm ³ /(cm ² ·s)	The property of the material to absorb moisture in the air when the air humidity is 100 percent, %
Vinyl leather with polymer coating	0	0
Thick floral texture vinyl leather	0,02	0,6
Vinyl leather with an interlaced polymer coating	0,35	1
Polyamide gasification	15	7
Semi-sherst gasification	14	22
Polyamide knitting	40	6
Polyamide knitwear treated with polyurethane	35	7

Natural fibers are poorly used in the manufacture of finishing materials. Sherst and semi-sherst materials are used to cover the mounds of high-class cars. Polyamide and polyhedral threads are widely used.

One of the important characteristics of coating materials is their resistance to exposure to sunlight. In terms of resistance to the effects of sunlight, natural sherst materials have good properties. The resistance of synthetic gases to the effects of ultraviolet light varies: the resistance of polyamide-based gases to the effects of ultraviolet light is poor, and the durability of polyurethane-based gases is good. Polyacrylonitrile-based tissue materials have a high resistance to exposure to sunlight.

Currently, such semi-sherst materials as " Strelka", " Gazon", " Dorozhnaya", " Olympiyskaya", " Oka " are widely used.

Artificial skin. In automotive engineering, one of the most widely used materials as a coating material is artificial leather. Artificial leather is used to cover car pads, seat backs, salon ceiling, side panels and other details.

The artificial skin surface used in automotive industry consists of a polyvinyl chloride coated tissue base, and natural (cotton), synthetic (polyamide and polyurethane), artificial or mixed fibers are used as a tissue base.

Artificial skins used in automotive asossan are produced in three types: viniliskoja - VO-T based on aerating; viniliskoja - VO-TR on a knitted basis; viniliskoja - VO-NT, the basis of which is non-aerating.

Artificial leather can be used in harolarts above minus 400 C. Air permeability 0.02-0.35 cm³/(cm²/s).

To cover the ceiling of the salons (cabins) of cars, artificial skins of a special brand (viniliskoja-TR, viniliskoja-NT, viniliskoja-T IKAP) are produced.

Materials for covering the floor of the car. The insulation properties of the car floor covering from heat and noise should be good, wear resistance and high friction coefficient, be resistant to oil and gasoline influences, and the operating temperature range should be as wide as possible. When covering the car floor, rubber mats, alkyd and polyvinyl chloride linoleums, tissue materials are used.

Rubber beds are produced in three types: for temperate climatic conditions (Type I), for tropical climatic conditions (Type II) and for cold climatic conditions (Type III). Their strength in stretching is 4.0; 5.5 and 4.5 MPa, respectively.

When covering the floor of a car, linoleums such as relin, alkyd, Autoline are used. Autoline linoleums on a tissue basis fully meet the requirements for the materials used in floor covering. Autoline is produced in the form of a wrapper with a length of 10.5 m with a width of 1490 mm, a thickness of 2.7 and 3.5 mm.

Gasket and compacting materials. When assembling car trinkets, the need arises to hermetize the places where the details work by mutual touch. In meeting this need, gasket and compacting materials are used. They are used to prevent fluid leakage and leakage from places where details are attached, the release of gases from flanges, and to hermetically store friction knots from dust and moisture. Gaskets are made from materials with gaskets of various shapes (by adjusting the attachment details to the inter-tapping surfaces), which are used when attaching non-ferrous details. Compacting materials are in most cases referred to as sal Nicks and are used in compressing the slits between the details that work rotating among themselves. The gasket and compacting materials must have a high strength, the necessary elasticity and at the same time not too large rigidity. Therefore, according to the conditions of use of these materials, they must be resistant to the effects of high temperatures, oil products and water. Materials from which Sal Nick is made must also be resistant to decay.

Various chemically treated papers (parchment, cardboard, fibra - working temperature up to 1500 C), felt (suitable for use at temperatures up to 750 C), asbestos (suitable for use at temperatures up to 3500c), paronites of various brands (vulcanized lists of a mixture of asbestos, rubbers, fillers), oil and gasoline-resistant paronite MBP-5 (reliably works up to a temperature of armirdangan with mesh, can be used at temperatures up to 4000 C) and others are used.

Treated with zinc chloride, pressed paper or cardboard fibre has a high mechanical strength and resistance to the effects of petroleum products. Gaskets (gastirmabop fibra KGF), details of the electrical apparatus (electrotechnical fibra FE) are made from it. The maximum operating temperature of paper materials does not exceed 140-150 oC. At such a high temperature, their elasticity is lost, burns.

For the preparation of salniks, gaskets, in addition to oil, gasoline-resistant rubber, technical moisture is also used. These are porous list materials made of felt wool. Its insulating properties from heat and sound, its depreciation property is higher.

By pressing the bark of the bark tree, the bark material is obtained. They are used in the environment of water, oil products, under small mechanical loads, and when compressing compounds that heat up to 100-1200 C at most (valves box, fuel tanks, caps of cap chambers, filters glass, engine crankcase, headlight glass, etc.).

Asbestos is widely used for heat insulation and compaction of high-temperature working details (gaskets in input and output collectors, engine cylinders, head, etc.). Asbestos is a natural fiber material that can be broken down into thin, flexible and strong fibers. The electrical and thermal insulation properties of asbestos are good, do not burn, can work at temperatures up to 3500c, but at a temperature higher than this, its strength and elasticity are lost. In repair work, cardboard, paper tissue, tape, ropes and thread-looking asbestos are used, as well as crushed asbestos.

From a mixture of asbestos (60-70 percent), vulcanized rubber (12-13 percent) and filler (soil, talc), paronite is obtained, a light material that is resistant to the effects of petroleum products, tolerates a temperature of 4500c. From paronite, gaskets are made for details to which fuel and oil touch (covers of distribution sheeters, flanges of oil receivers, gaskets of a water pump, fuel clarifier, etc.).

By pressing a mixture of graphite, rubber, sulfur and some other substances, the light material is obtained called klingerit. Gaskets made from it can work at a temperature of 180-2000 C.

To reduce noise in the cabins of cars, special mastics are used. BMI-1 Mastic in the form of a black homogeneous liquid mass has good properties. It is covered by spraying on a metal surface or on surfaces on which the primers FL-93, EF-093 are applied. Mastic dries in 30 minutes at a temperature of 100-1100 C. The coating also protects metals from corrosion.

Electroinsulating materials. Under electroinsulating material is understood as a material that practically does not conduct electric current. For the repair of electrical equipment of cars, electrical insulation materials are used. They must be durable enough to withstand high voltage, as well as be resistant to thermal effects (for materials that work in some hot conditions).

These requirements are met by a number of materials considered in the previous chapters of this book: most plastics (textolite, getinax), rubber, ebonite, Varnishes (asphalt bitumen, glyphthal, canifolly, etc. Varnishes), asbestos, fibra, cardboard, etc. In addition, Mica and miconite materials are used as an electroinsulating material that can withstand heating up to a temperature of 5000 C. Mica is a transparent mineral that can be broken down into thin plastics, while miconite is glyphthalated with tar.

As an electrical insulation material, lacotcano (cambric) is much more common, electrical insulation varnish is impregnated thread, silk gauze or glass tissue. They are released in the form of wraps, lists, tubes.

Most often it is necessary to use insulation tapes. This tape consists of a Mith on one or both sides, in which a rubber mixture is soaked. The tape is used to insulate the connected areas of electrical wires. Adhesive insulating tapes made by applying a layer of glue to a plastic film material are common.

Wood materials. Wood materials are widely used in the national economy, including automotive. Because the mechanical strength of the wood is good, the density is not large (1.5-2 times lighter than water), tolerates vibration loads well, conducts heat slowly (three times slower than steel), expands when heated. It can also be easily processed into wood and glued together. Therefore, wood materials also have a number of disadvantages: they rot, burn easily, do not have the same mechanical properties in terms of cross-section, easily absorb moisture and change their size and shape. Due to these disadvantages, wood materials are rarely used in modern cars.

One of the distinctive features of wood as a structural material is its moisture content. Absolute humidity refers to the percentage of water content in Wood expressed in percent (relative to Wood mass). The moisture content of freshly cut trees reaches 50-60 percent. The humidity of the wooden materials from which the car details are made will be in the range of 12-18 percent.

Small-sized details should be made of wood with a moisture content of no more than 15 percent, otherwise its dimensions will change during the use of these details. For the details to be prepared by gluing, a drier (no higher than 10-12 percent humidity) Wood will be needed. When choosing wood for the preparation of details applied under certain conditions, it is necessary to take into account its hardness. The most common tree species, according to the degree of decrease in hardness, are arranged in the following order: grab-shumtol-Oak-spruce-Maple-tilogoch-ol ha-pine-spruce-white pine-argivon. Solid wood is used to make details that work under load, and soft wood is made of details that do not fall under load, and are also used in various finishing works. Wood materials from Ninabargli trees are the most used because they are much more robust than deciduous trees, less rot (they contain a lot of tar substances that prevent rotting). From them, the floor and board of cargo cars, transverse balconies of the body are made. The operational properties of larch and oak wood, i.e. high hardness and strength, are more resistant to rot.

For the purpose of preparing details, operating and repairing cars, as well as economic work at motor transport enterprises, wood materials of various shapes are used.

The smallest transverse cross section in length is called a wooden crossbar with a diameter of not less than 150 mm. When sawing the rod along the longitudinal axis, plates, characles are formed.

Wood materials are divided into bruses (width and thickness more than 100 mm), bruschas (not more than twice the width thickness) and boards (more than twice the width thickness), depending on the dimensions of the transverse cross section. Reika and planks are considered a kind of small-sized boards. According to how it is processed, wood materials are divided into varieties with four sides sawed and the edges not sawed or partially sawed.

When wood products or wood products are stored outdoors, their humidity increases, so that they can shed and rot. The use of rotten wood is not allowed. Wood damaged by insects cannot be used either, since their strength will have sharply decreased. To prevent wood from rotting and insect damage, wood details are often

covered with varnish-paint. Most often, wooden products are impregnated with special compositions that prevent rotting-antiseptics (a mixture of chlorinated zinc, fluorinated sodium).

To increase the fire resistance of wood, special compositions are soaked in it or painted with Fire Protection paints. When these substances heat up, they form a curtain on the wood surface that prevents air from entering. Such treated wood only captures under the influence of fire, quickly turning off as soon as the source of fire is moved away. These coatings are applied to Wood after continuous processing.

From birch, ol ha, Oak, spruce and some other wood, a veneer is made - a wide smooth pairah with a thickness of 0.5-1.5 mm; veneer is cut from a spinning piece of wood. Veneer is made from plywood, wood-layer plastics, glued egic dntals; veneers made of Oak, spruce, walnut trees are used to form a coating in the form of a valuable tree; a separator of a battery of cars batteries is made from veneer from ol ha and Kedr.

By gluing three or more layers of veneer with a cross-perpendicular arrangement of wood fibers, plywood is obtained from BIL; they are produced with a thickness of 1.5-15 mm, a width of 725-1525 mm and a length of 1220-2440 mm. Different brands of plywood differ from each other in the type of glue used in them: FSF-made with high water resistance, phenolformal degid glue; FK - made with urea glue, with medium water resistance. FBA plywood made with protein (casein) glue has a low water resistance.

Bakelized FBS plywood is obtained by insulating veneers made of birch with phenol tar or crezolformal degid Tar. Its water resistance is high. It can be used in structures that can be attached mechanically, as well as glued cold.

Control questions

1. Poliefiracrylate adhesives.
2. Adhesives based on Polyvinyl Chloride polymers and sopolimers.
3. Adhesives for attaching wooden products.
4. Adhesives applied at high temperatures are vakauch-based adhesives.
5. Tissue coating materials and artificial leather.
6. Gasket and compacting materials and electroisolating materials.
7. Wood materials.

REPUBLIC OF UZBEKISTAN
MINISTRY OF HIGHER AND SECONDARY SPECIAL
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CONSTRUCTION



NONMETALLIC MATERIALS USED IN VEHICLES



METHODICAL INSTRUCTION

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Nonmetallic materials used in vehicles methodical instruction on the subject 60712500-designed for students of the directions of engineering of vehicles.

Tuzuvchilar: PhD G.Valiyeva.

Taqrizchi: DcS. R.Soliyev.

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II. PRACTICAL TRAINING MATERIALS

1-PRACTICAL TRAINING

Module: study of methods for testing plastics used in vehicles.

Determination of water absorbency of plastic materials.

1. Purpose of the work: to teach students to determine the water absorbency of plastic materials.

2. Necessary tools and equipment.

1) disc with a thickness of 3 ± 0.2 mm and a diameter of 50 ± 1 mm.

2) brus with dimensions of $120\times 15\times 10$ mm or a sample in the form of a disc with a diameter of 100 mm with a thickness of 4 ± 0.2 mm.

3) special oven for drying material.

3. The procedure for performing practical training.

1) dry the samples and prepare them for the test.

2) after storing the samples in the required liquid, they are dried in special furnaces and the water absorption of the material is determined by the required formula.

Water absorption is the amount of water absorbed into a sample standing in cold or boiling water at a certain temperature and time.

It is expressed in mg or percentage and allows you to know how porous the sample being examined is. For inspection, disk-shaped samples are used, which are pressed or poured under pressure. The diameter of the disc is equal to (50 ± 1) mm thick (3 ± 0.2) mm.

If the sample being examined is a list or laminated plastic, then samples in square shapes are cut out, the size of the sides of which is equal to (50 ± 1) mm. The thickness of such a sample is not specified, and it is taken as it is.

A test can also be performed on samples cut from items in a profile picture. In this case, their dimensions will be as follows: from sterjens up to 50 mm in diameter: nahmunas of length (50 ± 1) mm and of the same diameter; from pipes with a diameter of up to 50 mm; samples of length (50 ± 1) and of the same diameter; and from pipes with a diameter of more than 50 mm, samples are

In this case, the sample should not exceed the length, width and thickness (50 ± 1) mm.

Procedure for carrying out work: before starting the inspection work, the samples are dried for 24 hours in a drying cabinet with a temperature of 50 ± 20 s. Samples of plastic with heat resistance 110 OS can also dry at 105 ± 3 0C for an hour. The samples are then cooled in a desiccator with calcium chloride on the bottom and each sample is weighed to an accuracy of 0.0001 g. Then distilled water is poured over it by placing it in a sample container (chemical glass). In this case, it is necessary to allow the samples placed in the glass to sink in the water so that they do not touch each other or the wall of the container.

The samples are left for 24 hours in water with a temperature of 23 ± 0.5 °C. Then the surface removed from the water is wiped with filter paper and immediately pulled with the accuracy described above. The vaccine that goes for weighing should not be found for more than 3 minutes.

Usually 3 samples are examined and their average arithmetic value is taken as test results.

Determination of wet absorbency of plastic materials.

The property of the material to absorb moisture in the air is called wet absorbency. The water absorbency of namuas from the material being tested is determined by holding them in an environment with a relative humidity of 97%.

The procedure for performing work. Wet absorbency dimensions are determined in samples in the form of a brus with a diameter of 120x15x10mm or a disc with a diameter of 100 mm and a thickness of 4 ± 0.2 °C mm. Samples are obtained by pressing or by the method of attachment under pressure. To do this, it is first dried at a temperature of 60 ± 2 °C for about 7 hours and then cooled by placing it in an eskicator. Cooled to room temperature, it is pulled to a precision of 0.0001 g and poured with an edge into special various eskicators, and an environment with a relative humidity of 97% is formed inside the eskicator.

The capacity of the eskicator is 10-15 l, the required humidity in it is formed by placing a solution of 500 ml of calcium chloride in 3% water. To determine the water absorbency in samples, they are left in an eskicator at a temperature of 20 ± 5 °C for 48 hours. In the process of testing, dew drops should not form inside the eskicator. After the specified time has elapsed, the samples are carefully wiped using filigree paper to remove excess moisture from the eskicator and immediately weighed on the scales.

Calculation. Wet absorbency is determined by the formula below

$$H_{uu} = \frac{q_2 - q_1}{q_1} \cdot 100\% ;$$

in this place, q_1 - the weight of the dried sample up to the date g,

q_2 - samplanig weight after testing g.

As a result of the work, the average arithmetic amount of three (arithmetic quantities are obtained) parallel checks is taken. The water absorption of plastics does not exceed 1.5...2%.

Determination of the resistance of plastic material to the effects of oil, gasoline and alcohol.

The resistance of plastics to the admixture of oil, gasoline and alcohol is the property of preserving their initial physical and mechanical properties when these liquids are admirable to them. When admiring polymer materials, oil, gasoline and alcohol, chemical destructions can occur in them. As a result, their physical and mechanical properties (strength, surface hardness elasticity module, etc.) change at a certain level. Since plastic is used in conditions where most details are associated with the education of oil, gasoline and alcohol, it is important to determine their resistance to the admiration of these substances.

When testing for resistance to admixture of oil, gasoline and alcohol, samples taken from plastic materials will change their weight if one of these aggressive liquids is kept at room temperature 20±2 °C for 24 hours. In this case, the sample of the material being examined is in the form of a bar, the dimensions of which are equal to (120±2)×(15±0.2)×(10±0.2) mm.

The procedure for performing work. The mass of the tested sample is weighed on an analytical scale to an accuracy of 0.001 g and poured into glass jars with a capacity of 500 ml. The number of Jars is 3, from which gasoline, transformer oil and ethyl alcohol were previously poured, respectively. Two samples are placed inside each jar so that they do not touch each other and left at room temperature for 24 hours. The samples are then removed using tongs (pliers) and wiped thoroughly with filter paper and reweighed. The time from the moment the sample is taken out of the liquid until it is weighed should not exceed 5 minutes. The change in the sample mass is expressed in the percentage contribution.

Calculation. If the sample mass has increased after inspection then the tolerance is found by the following formula.

$$r = \frac{q_2 - q_1}{q_1} \cdot 100\% ;$$

here, q_1 - is the mass of the sample before verification, g, g,

q_2 - is the mass of the sample after verification, g, g.

If the mass of the sample decreases after a certain time has elapsed within the liquid, then the calculation formula will be the same, and the result will be represented by a negative (minus) sign.

$$r = \frac{q_1 - q_2}{q_1} \cdot 100\% ;$$

here, q_1, q_2 the above itself. In the habit, a sample of 3 is checked and the arithmetic mean is obtained.

Plastic material stretch test

The strength limit of plastics to elongation is σ_{choose} – the ratio of the highest stretching force to the face of the sample transverse cross-section.

As a result of the tensile strength test, in addition to the elasticity module E, the following are determined:

A) tensile strength (MPa) – the ratio of the force at the sample break to the face of its initial transverse cross section;

B) the limit of leakage in the stretch (MPa) – the voltage at which deformation occurs in the sample, even if the amount of force practically does not increase;

C) relative elongation at the break time (%) is the ratio of the sample base length gain to the initial length of the sample base.

The highest stretching force causes the sample to break off. The Material samples are tested on special stretching machines. In this case, the material is influenced by a force that gradually increases from zero to the force of the sample breaker. The amount of voltage is measured using power meters (dynamometer).

Samples of plastic applied for testing are obtained from taeyor zagatovkas in special press molds or using mechanical methods by pressing, pressure casting, stamping. The shapes and sizes of the samples are standardized, and they appear in five

different ways. Figure 1 shows the type of samples, and Table 1 shows their dimensions.

Sample types are obtained according to the type of plastic, in which type I – plastics with a high relative length in elongation (polyethylene, plasticate PVC); type II – most are thermoractive, thermoplastic and layered plastics; Type III - -glassplastics; while Type IV and V are used to test homogenous structural thermoplastic and thermoractive plastics.

Test samples from listed and layered materials are made by cutting in two directions (longitudinal and transverse) from the test plates. In this case, the thickness of the same list or plate will remain in place of the sample thickness, but it should not be more than 10mm. If the slab thickness is more than 10 mm, then by processing only one side of the slab at that time, its thickness is brought to a 10 mm appearance.

Table 1. Dimensions of samples tested for elongation

Sample sizes	Sample types				
	I	II	III	IV	V
Total length, L	115	150	150	80	80
The width of the skull, V	25±1	20±0,5	-	-	11,0±0,2
Length of workpiece, l	33±1	60±0,5	-	40±0,5	40±0,5
Width of the workpiece, b	6±0,4	10±0,5	15±0,5 20±0,5	-	5±0,2
Radius of curved places, r	14±0,5	60 dan kam emas	-	6±0,2	6±0,2
R	25±1	-	-	-	-
The distance between the marks drawn on the sample surface, the part that does not fit between the machine clamps, A	80±1	115±5	100±2	-	52±1
Sample workpiece thickness, h	1...2	3...4	0,5...6	-	3...4
Base length, l ₀	25±1	50±0,5	5,0±1	25±0,5	25±0,5
The diameter of the skull, D	-	-	-	11±0,2	-
Diameter of the workpiece, d	-	-	-	5,0±0,2	-

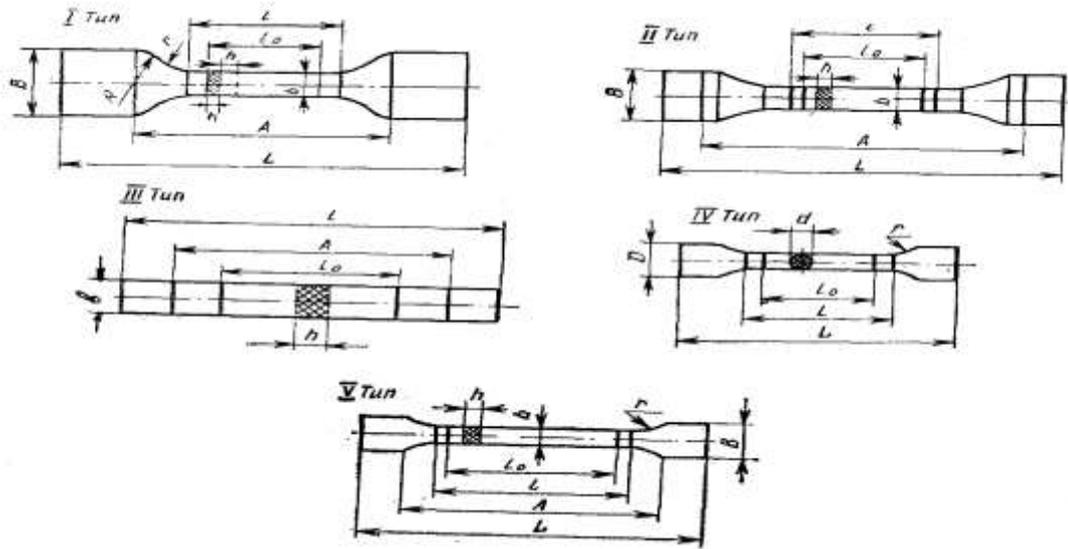


Figure 1. Sample types used when testing plastics for stretch.

The stretching speed of the cutting machines is different, usually it is 10 for plastics...It is 20 mm / min. Their exact value is quoted in standard and technical terms for the respective plastics.

The procedure for performing work. Testing work is carried out at the room charter. The number of samples should not be less than five of the same material. Before testing, the thickness and width of the sample workpiece to be stretched is measured and its cross-sectional face is determined. The measurement is carried out from at least three places of the sample to an accuracy of 0.01 mm. The sample being tested is then secured between the machine handles. At the time of testing, one of the machine handles will be fixed. Usually, the upper handle of the plucking machines is fixed, and the lower handle is movable. After the sample is installed between the clamps, a force is introduced into it, which gradually increases until a sample – breaking force is formed from scratch. Then the amount of force at the time the sample is disconnected from the Machine Scale is determined by the score N (Newton).

In addition, for film materials, it is also determined how long it is stretched up to the break time.

Hisoblash. Break-in tension in the stretch $\sigma_{cho'z}$ and the limit of leakage in the stretch is σ_{choose} . White-is found by the following formulas: $\sigma_{uyz} = \frac{P_P}{b \cdot h}$;

$$\text{MPa} \quad \sigma_{uyz.ok} = \frac{P_{T.P}}{b \cdot h} ; \text{MPa}$$

Here: Rr is the force at the time the sample is disconnected, N; RTR is the force at the beginning of the leakage limit, N; b is the width of the sample workpiece, CM; h is the thickness of the sample workpiece, CM.

As a result, the average arithmetic value of five checks is obtained. Relative elongation of the sample at the break time (Echo) and relative elongation corresponding to the leakage limit (Echo).White) is found in the

following formulas: $\varepsilon_{chuz} = \frac{\Delta L_{chuz}}{l_0} \cdot 100, \%$

$$\varepsilon_{chuz.ok} = \frac{\Delta L_{chuz.ok}}{l_0}; \%$$

Here: $\Delta l_{cho'z}$ – increased part of the length of the sample base at the break, mm;
 $\Delta l_{cho'z.ok}$ – increased part of the sample base length at the leakage threshold, mm; l_0 – initial length of sample base, mm.

Plastic material compression test

The ability of samples to resist the action of compressive forces until a fracture Falls is called the limit of the strength of plastics to compression.

During testing, the following indicators are determined:

a) breaking voltage in compression, MPa – the voltage that breaks the sample or tightens it is the ratio of the sample to the initial cross-sectional face;

b) the limit of leakage in compression, the ratio of the amount of voltage to the surface of the initial transverse cross – section of the sample, which occurs to an increase in deformation if the amount of MPa-absorbing Force does not increase.

Compression testing is also carried out on machines with stretch testing. In this case, the test machine is provided with two flat parallel plates, which must approach each other at an invariable Speed (2 ± 1 mm/min). The sample must lie under one axis in relation to the force acting, and the force acting must be evenly distributed along its transverse cross-sectional face. Therefore, one of the tiles itself will be deployable.

Samples for testing are obtained using mechanical methods from ready-made materials in the form of pressing, pressure casting, slab, list, sterjeng'. The shape and dimensions of the samples to be tested are shown in Table 2.

If, when testing the material for compaction, its dimensions are not taken as shown in the table, then the sample height is 10...It is possible to take 40 mm and prepare the base with a ratio of height to the base equal to 1.5. In the prepared samples, the base plane should be parallel and perpendicular to the sample axis.

The samples should be smooth and even and free of defects. The number of samples being tested from each material should not be less than five.

Table 2. Dimensions of the samples to be tested

Sample view	Material elasticity module, MPa	Sample sizes, mm			
		h	a	B	d
1. Parallelepiped with a square base	1*10 ³ greater than 1*10 ³ small from	30±0,5	10±0,5	10±0,5	-
		15±0,5	10±0,5	10±0,5	-
2. Parallel-tubular, the basis of which is a polygon	1*10 ³ greater than 1*10 ³ small from	30±0,5	15±0,5	10±0,5	-
		15±0,5	15±0,5	10±0,5	-

3. Cylinder	1*10 ³ greater than	30±0,5	-	-	12±0,5
	1*10 ³ small from	15±0,5	-	-	10±0,5

The procedure for performing work. The sample size is measured to an accuracy of 0.01 mm before testing. Then they are installed on the base plates of the test machines in such a way that the longitudinal axis of the sample must correspond to the direction of force acting. Then the car is launched, and its compression plates begin to approach each other at a speed of 2±1 mm/. Compression occurs in the sample, it either breaks, or cracked. Destructive power is obtained from the scale of the machine.

If, according to the standard and technical conditions, the sample sizes differ from those recommended in the table, then the rate of joint convergence of the plates at that time is found by the following formula:

$$v = 0,03h \cdot 1/t;$$

here: v – the speed of approach of the plates, mm/min; h – initial sample height, mm; t – time, 1 the minute is equal to.

from the speed found, calculated by the real value of the speed of approach of the plates ± 50% may vary to.

Calculation. Breaking voltage in compression σ_{ts} , leakage limit in compression σ_{ts} it is found using the following formulas:

$$\sigma_{pc} = \frac{P}{F} \quad \text{va} \quad \sigma_{TC} = \frac{P_1}{F};$$

Here: R – destructive power, N; R₁ – force at the time when deformation growth occurs even if the impact force does not increase, N; F – sample cross section face, cm²: for samples in the form of parallelepiped

$$F = a^2 \quad \text{yoki} \quad F = b \cdot l$$

for samples in the form of a cylinder

$$F = \frac{\pi d^2}{4};$$

For samples in tube form

$$F = \frac{\pi(D^2 - d_1^2)}{4};$$

Here: a – the base side of a parallelepiped whose base is a square, cm; v – the width of the base of the parallelepiped, the base of which is a tapered rectangle, cm; l – the length of the base of the parallelepiped, the base of which is rectangular, cm; d – cylinder diameter, cm; d₁ – inner diameter of pipe, cm; D – outer diameter of pipe, cm.

As the results of the work, the average arithmetic value of five samples is obtained.

Testing the plastic material for static bending.

It is very difficult to test fragile materials for stretching and compaction. Therefore, in order to find the deformation – strength property of such materials, they are tested only on bending. Such materials include Pheno – and aminoplasts,

multilayer plastics, toplined materials. They are difficult to be doomed to machine clamps and crumble over the supports while they are trying to squeeze.

The ability to resist the impact of the material on the bending nagruz is called static bending strength. After passing this border, the material will break.

Testing of plastics for static bending under the influence of a short – term load is carried out aosan GOST 4648-71. Such a test is based on determining the strength limit of the samples to the bend, finding the ratio of the highest bending moment to the Resistance moment of the transverse cross-section of the sample, and also finding the maximum bend at the moment when the test sample from its previous position came to the test moment.

The method under consideration is not suitable for gas-filled plastics and list materials cmaller than 1 mm thick. There are special testing methods for them.

For testing, samples are obtained by pressing, pouring under pressure and mechanical processing of finished zagatovkas. In addition to pouring under pressure, the samples prepared by the presented methods are in the form of a Brus with a ground angular cross section. Their dimensions are 120x15x10 mm. And the dimensions of the samples poured under pressure are 55x6x4 mm.

Samples are prepared for testing on the basis of a special instruction. If there is no such instruction, the samples are held for at least 16 hours under conditions of 200s and a relative air humidity of 65%, then proceed to testing.

The procedure for performing work. Depending on the thickness of the sample, the distance between the supports is selected, and the sample is fixed on the base in such a way that force falls on its wide side (fig. If mechanical processing is carried out on one side of the sample , then the sample is fixed on the base with a mechanically unprocessed side.

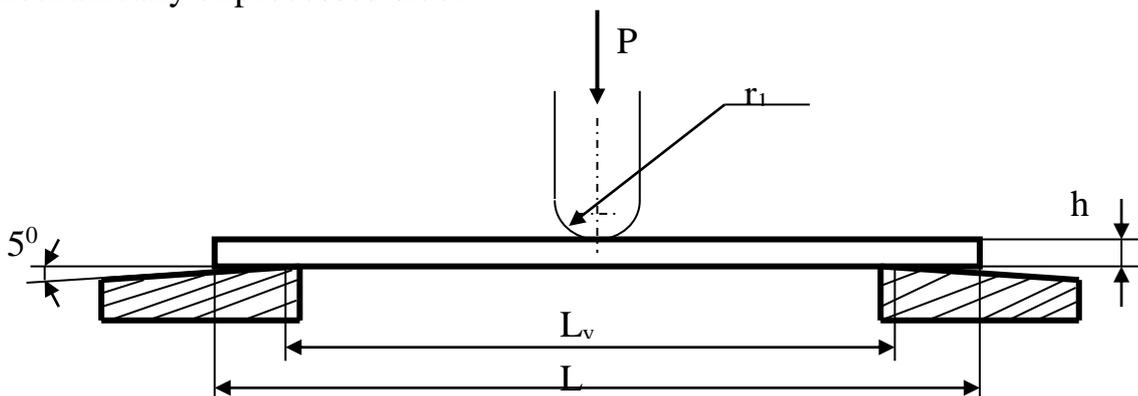


Figure 2. Supports applied to test plastics for static bending.

The force is given to the sample in one mehyor, perpendicular to its middle part. In this case, the sample is bent from the effect of force, while the axis is tilted to the mahlum distance. From the effect of Nagruzka, the sample can either break or not break.

Calculation. Breaking voltage at bending σ_{eg} and the maximum voltage at the bend $\sigma_{eg.max}$ it is found using the following formulas.

$$\sigma_{eg}(\sigma_{eg.max}) = M/W$$

here: M – bending torque, MPa; W – sample cross section resistance torque, cm^3 .

The bending moment is found by the formula:

$$M = \frac{P_{eg} \cdot L_y}{4}; \quad M = \frac{P_{eg \cdot max} \cdot L_y}{4};$$

here: R_{eg} , $R_{eg \cdot max}$ – voltage quantity, N; L_y – distance between supports, CM.

The sample resistance moment is found by the formula:

$$W = bh^2/6;$$

here: b – sample width, cm; h^2 – sample thickness, cm.

$$\text{From this } \sigma_{eg} (\sigma_{eg \cdot max}) = \frac{3P_{eg} \cdot (P_{eg \cdot max}) \cdot L_y}{2bh^2}$$

As the results of the test, the average arithmetic value of all parallel checks is taken.

Checking the strength of the plastics to the cut.

This method is based on determining the cutting ends when cutting plastic samples of a certain size and shape between 2 planes. Cutting deformation can be likened to cutting with metal (e.g. tunic) scissors. For list materials that are porous and less than 2 mm thick, this method is not suitable. Testing can be carried out on any testing machine. In this case, the error allowed when measuring the load should not be more than 1% of the amount of load to be found. The device that determines the strength to the cut must be able to squeeze the sample tightly and intersect in its middle part in two planes. The cutting blade and supports are made of refined hard steel.

4.the thickness of the blade. When cutting samples up to 6 mm (15+0.5)mm thick is 6...while when cutting samples up to 10 mm (25+0.5)mm.

The width of the blade, on the other hand, should not be less than 16 mm in both cases. For testing, samples in the form of dimensional brus are used, as follows with a ground angular cross section. Length at least $l=100$ mm; width $v=15+0.5$ mm; thickness $h=15+0.5$ mm. If samples of such size can be made, then the sample will also use the reciprocal ratio of thickness, width and length as follows. $h:b:l=1,0:1,5:10$ in this case, the thickness of the sample should not be less than 4 mm. Samples of laminated plastics should be taken in such a way that both the perpendukilar and the parallel can be passed in relation to the layers.

When making samples from plates with a thickness of more than 10 mm, only by cutting or bending them by one side is brought to the desired size. The number of samples taken for testing should not be less than five. Before the start of testing, each sample is measured to an accuracy of 0.01 mm in width and thickness.

The procedure for performing work. To test the cut, the distance between the supports and the speed at which the blade approaches the sample will be as follows.

Sample thickness, mm 4.0 ... 6.0.

The distance between the supports, mm 15+0.5 the speed of approaching the blade to the sample, mm/min 2.0.

The speed at which the blade approaches the sample also depends on the sample thickness, which is found as follows for samples with non-standard thickness:

$$V=0.5 h/t, \text{ mm / min};$$

here: h-Sample thickness, mm; t-time, it is equal to 1 min.

Calculation. The strength of plastic samples to be cut (σ_{kes}) is found by the following formula:

$$\sigma_{kes} = R/2F ;$$

here: R- cutting force, N ; Ye - cross-sectional face of the sample, cm².

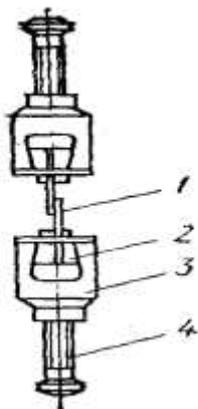
As the results of the test, the average arithmetic value of all parallel checks is taken.

Plastmassalarning siljishidagi mustahkamligini aniqlash Determination of the strength of plastics in their displacement

The method of testing the strength of plastics for displacement differs from the methods of testing their strength for stretching, compression and bending in that they do not have a state standard. Therefore, in determining this indicator, the state standard GOST 14759-69 is used to determine the strength of glued materials (metal, plastic, etc.) to slip. The limit of strength in the displacement of glued materials is carried out on machines that do not break the stretch. Their testing work is carried out at normal, lower and higher temperatures, depending on what conditions they are used. The essence of the shift test method is the disconnector in the stretch of a standard sample glued over and over consists in determining the amount of force.

This is the magnitude of the force that can shift one piece of the sample relative to another.

The strength limit in the shift is determined in the tensile machines that are tested for elongation. They are provided with special handles heads so that the appearance of the handles is shown in Figure 3 .



3-rasm. Tutqichli kallak.

1-namuna,
2-ponasimon
tishlagich, 3-kallak
korpusi, 4-tortqi.

The samples taken for testing are made of metal (or plastic) in the form of two oblong lists. The shape and dimensions of the sample are shown in Figure 4. The side areas of the glue seam are cleaned before testing. The total number of samples taken for testing will not be less than 5. The samples are kept at room temperature for 12 hours before testing. If in specific technical documentation for the same samples this is followed if other ways are indicated in the preparation of the sample. Figure 5 shows which areas of the sample should be measured for calculation. By measuring the thickness of the sample, its average arithmetic value is obtained. The thickness

of the glued seam the thickness of the glued area is equal to the thickness of the glued circuit from t.

In the drawing, distance b is found by the following formula.

In the drawing, the distances a1 and a2 are also measured and their average arithmetic value is obtained. Namunalarni sinash mashinalarining orasiga

o'rnatishdan oldin har bir namunada bir biridan 55 mm masofada ko'ndalang belgilar quyiladi.

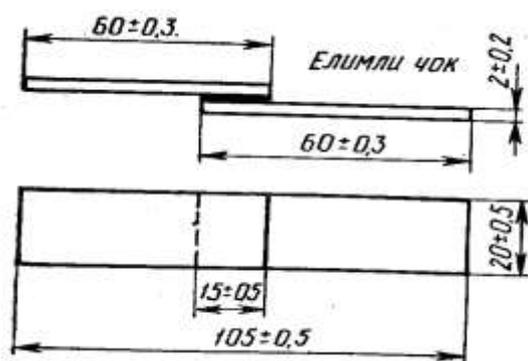


Figure 4. Overlapping glued samples.

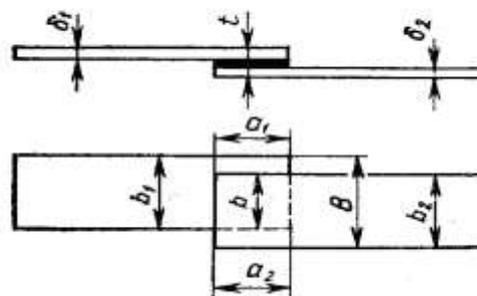


Figure 5. Sample measurement scheme.

The procedure for performing work. The samples prepared for testing are installed between the handles of the cutting machine in such a way that they fit with the longitudinal axis of the sample and the axis of the handles. Then the amount of force is gradually increased until the sample is interrupted.

The speed of movement of the machine handle during testing is 10 mm/min. According to the state standard, the test is allowed to take the speed of movement of the handles up to 20 mm / min.

At the time of testing, the largest amount of load that leads to the transfer of the sample is determined. At the end of the test, both disconnected parts of the sample are carefully observed and their character is determined. In doing so, the glue can go along the plane or break away from the glue itself.

Calculation. The limit of strength in the displacement of the adhesive compound τ is found in the formula below.

$$\tau = P/F, \text{ MPa}$$

here: R – disruptive loading, N;

F – glued surface, cm^2 .

$$\tau = a \cdot b$$

here: a – the length of the place where the glue is applied, cm; b – width of the place where the glue is rubbed, cm.

As the results of the test, the average arithmetic value of parallel transferred applications is obtained.

Testing plastics for gilding between two supports

One of its important properties is the strength of plastics in terms of gilding forces. The gilded consistency often serves as the main factor in the division of plastics into classes. For example, in the norms of the FIAT firm, only two indicators for plastics used in automotive industry play a key role in dividing them into classes. One of them is the strength for the tattoo, and the other is heat resistance. To determine the strength to the tattoo, a simple tool is used – a pendulum jacket. Consistency is measured by the amount of work spent on breaking the sample.

The multiplication of the turnover of the pre-and post-tattoo pendulum heights by the weight of the pendulum determines the amount of work spent on the fracture of the sample. The ratio of breaking energy to the weakened face of the sample cutiningn is called Gilded viscosity.

Gilding consistency is called zarbiness differently, since viscosity characterizes the ability of the material to absorb and distribute energy during deformation.

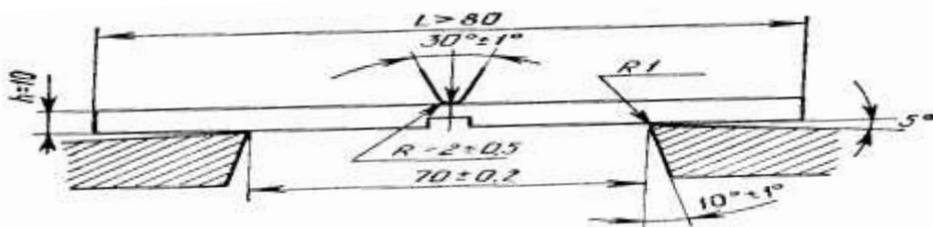


Figure 6. Scheme of laying a load on a sample in a gilded bend with two supports.

Figure 6 presents a scheme for placing a load on a sample in a two-support gilded bend. Determination of gilding allows you to find the following indicators:

A) The Gilded viscosity of a non-groove sample, the ratio of the amount of work spent on breaking such a sample to its cross-sectional face;

B) The Gilded viscosity of the sample with the groove, the ratio of the amount of work spent on breaking such a sample to its cross-sectional face;

C) the attenuation coefficient of zardy viscosity is the ratio of zardy viscosity to non-zardy viscosity of a sample with yah groove.

Testing work is carried out on a pendulum jacket with two support points for installing a sample. The scheme of the tool is shown in racm 7. To the middle qicm of the sample, the force of the gilding is given by the pendulum. The oscillatory plane of the pendulum will be perpendicular to the longitudinal axis of the sample installed on the supports. The falling speed of the pendulum is 2.9...3,8 m/s.

Samples from List, slab, sterjen and similar materials are made by mechanical processing. And samples from powder-like reactoplasts are obtained by pressing, and from thermoplasts by casting under pressure.

The procedure for performing work. When testing by the Sharpi method, samples of two types are obtained: brus with a size of 10x15x120 mm and a small brus with a size of 4x6x50 mm. Before testing, the thickness and width of the sample are measured from the average qicmi to the accuracy of 0.01 mm, and the cross-sectional face is found.

The distance between the supports is taken so that the sample thickness is 40 mm if it is smaller than 5 mm, and 70 mm if it is larger than 5 mm. Then, starting the test, a sample is placed on two supports located on the lower qicm of the instrument, so that the force of gilding falls along its wide side. Raising the pendulum to the upper position(160o) is attached to a special handle. Scale arrow or dvijok it is brought to a lower position, then the pendulum is freely lowered by loosening the handle. In doing so, the pendulum will tap with the sample as it goes down, break it

and move to the back and rise to a certain height. The pendulum takes the arrow or Dvijok up a hill in this ascent. As a result, the arrow or dvijok indicates the amount of work spent on breaking the sample on the scale, or how many degrees the pendulum has risen back to the angle.

Calculation. Gilding of samples is found as follows Dj/m^2 ($1kgk \cdot cm/cm^2 = 980,7 Dj/m^2$):

$$a_n = \frac{A}{b \cdot h}$$

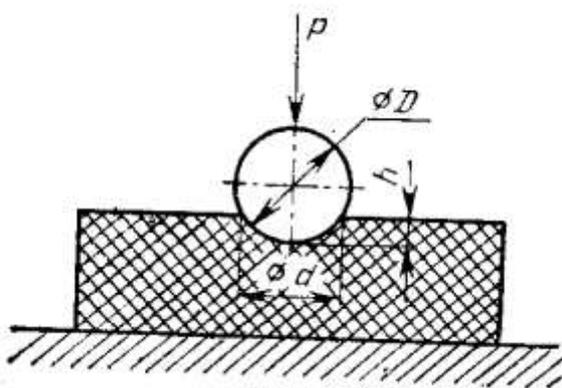
here: A- the amount of work spent on breaking the sample, Dj; b – width of the sample, cm; h - sample thickness, cm.

Determination of the hardness of plastic materials

The mechanical quality of plastics is also valued by their hardness. the rigidity of plastic is measured by the depth of immersion of another material Solid into it.

Thermorreactive polymers and materials obtained on their basis are materials with the highest hardness. Soft materials, such as polyethylene, have the smallest hardness index. The hardness of plastics is determined by the method recommended by Brinell. The essence of this method is to dip a ball – indenter made of solid steel with a diameter of 0.5 cm into a sample of material whose hardness is being tested (8-racm). After the force that the ball is placed for 60 seconds is obtained, a trace of the ball remains on the surface of the sample. This track is a sphere segment. The forces placed on the sample will be as follows: 50; 135; 365; 980 H.

Depending on the sample hardness, up to 1500 H of force can be applied in some cases. The amount of force exerted on the balloon is 0.013 in the material while immersing it in the sample for 60 seconds...The size of 0.036 cm is selected depending on the formation of the recess. The ratio of the pressing force placed on the balloon to the face of the resulting segment is called the number of stiffness per Brinell.



8-rasm. Sharchani botirish usuli bilan qattqlikni aniqlash sxemasi.

raised until it is ground with a steel ball. Then the indicator scale indicating how much the balloon has sunk is brought to zero. Then the steel ball is dipped into the material for 60 seconds at R strength. As a result, a trace – segment with a diameter d is formed on the surface of the sample.

Samples for testing are in the form of brus, plasticine, which are obtained by molding on special machines or mechanical processing into finished semi-finished products. In this case, the sample width should be 15, the thickness should not be less than 4-10 mm.

The procedure for performing work. For testing, three samples are taken from each batch material, each of which is subject to at least two checks. The sample is placed on the table and

Calculation. Hardness according to Brinell is found by the following

formula:
$$H_{\epsilon} = \frac{P}{\pi Dh} = \frac{2P}{\pi D(D - \sqrt{D^2 - d^2})}; \text{ H/m}^2$$

Here: P – bosuvchi kuch miqdori, H; D – balloon diameter, cm; d – sphere segment diameter, cm; h – sphere segment depth, cm.

2-PRACTICAL TRAINING

Module: Study of rubber testing methods used in vehicles.

Static test of the strength and elasticity properties of rubber.

Strength of rubber: in objects and materials made of rubber, stretching forces are characterized by stretching them for strength, since they are the most dangerous. At the same time, stretching is continued until the interruption of the sample in the direction of increasing force. In fact, rubber products work under much less load than indicated in the norm at the time of their operation.

Even so, Rubber Products lose their strength over time. The time that an invariant voltage goes from admiring the sample to becoming unusable is called its consistency at work at this time or its long durability. As the amount of tension increases, the durability of the distance is drastically reduced. The ability of rubber to maintain its shape during stretching depends on the speed of its deformation, the temperature, the composition of the rubber and its structure. The higher the stretching speed, the less force is required to break the sample. Because in this, the molecule chains are to a lesser extent orientation. Temperature changes during deformation are commendable to the consistency pointer. Usually with an increase in temperature, the strength of the rubber decreases, and vice versa. The test work is carried out at the specified speed and temperature in GOST or technical conditions for obtaining comparable samples.

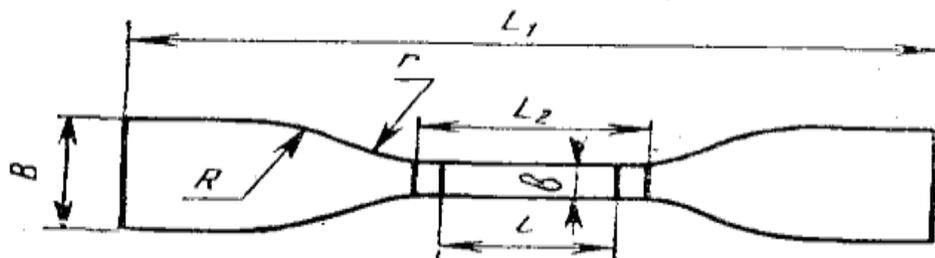


Figure 9. Standard sample and its dimensions.

The constant and linear structure of rubber molecules, the presence of functional groups that react and the nature of the connection of linear molecules with each other through a bridge also show admiration for the strength of rubber. The strength of the rubber also increases sharply at the expense of active earners, which are added to their composition, but decreases with a decrease in elasticity, the number of conductive chains. Just as well as more than necessary added plasticizers also reduce

their strength. This is due to the fact that plasticizers in rubber samples have a weakened mutual tensile strength of polymer macromolecules.

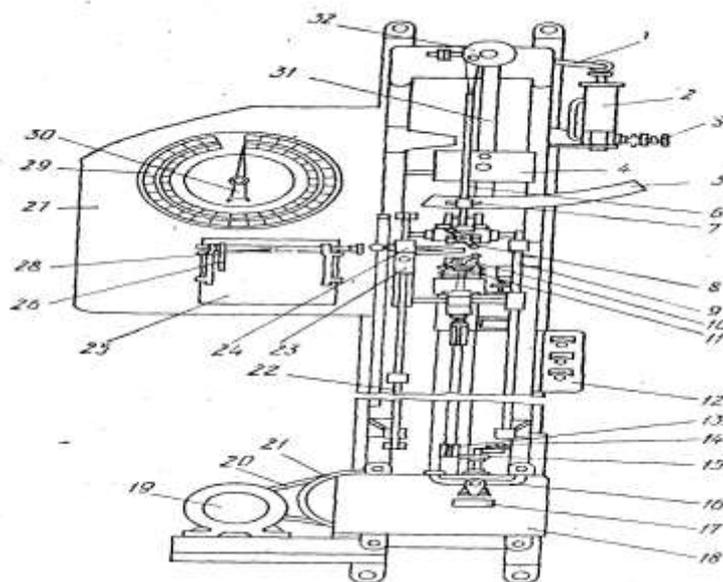
Procedure for performing work: 6-7 samples are cut out of the vulcanized rubber plate. To do this, the rubber plate is placed on some solid base and fixed together on the table of the cutting press. Then the carving knife is installed parallel by dipping it in a soapy solution and leaving 1-2 mm of space at the edges on the plate. The press table is then lifted up using a lever until it is taped with the traversa and released. a stamp and cut samples are taken over the press table.

A shovel (see 9th racm) with a special template applied to the paint is marked ss1 and aa1 lines. The shovels are securely fixed between the machine clamps. The samples are numbered so that each work plot is measured with an accuracy of at least 0.01 mm from the midpoint of the qicm. The results found during the measurement period are written in Table 3 below.

Table 3. Sample measurement results selected for testing

Sample number	Qalinligi , mm			Arithmetic mean value
	1- measure	2- measure	3- measure	

Samples selected for testing (23 ± 2) are condensed at S temperature for at least 1 hour,



then tested.

10-figure. General view of the RMI-60 stretch machine.

1-lever, 2-demfer, 3-drossel, 4-Load, 5-arc, 6-holder, 7-Stift, 8,10-clamps, 9-pointers, 11,14-last biklychatels, 12-start Knop, 13-chain, 15-pedal, 16-speed-changing pedal, 17-speed table, 18-

reducer, 19-electric motor, 20-shift, 21-pulley, 22-drawings, 23,24-pads, 25-writing mechanism, 26-Peroli koretka, 27-Shchit, 28-rollers, 29-tsifrblat, 30-arrows, 31 - pendulum, 32-pendulum axis.

Test results

4 Table

Test results	Samples						Deviation, %
	1	2	3	4	5	O'rtacha qiymati	
Dimensions of the sample working qicm until testing, m:							
Thickness width							
Cross-sectional face, cm ²							
Length, m							
Voltage, N:							
when stretching (%) in the interruption							
Sample length in interrupted time, mm							
Conditional voltage at lengthening time, Mpa							
Conditional consistency, Mpa							

Before starting testing, the machine Arrows are brought to zero. The number of arrows is two, one is a swinger, and the other is a pointer. the improved indicator on the kolodka 9 1800 is turned back (10-racm). The machine is lifted by pressing the pedal 15 until the bottom clamp steps 10 up, and the sample is fixed between the clamps by fixing it. In this case, the longitudinal axis of the sample must correspond to the direction of the stretch. Stretch marks are triggered on the signs of the working qicmi of the sample. The electric motor is moved by pressing the " Down " button, and the lower clamp of the pedal 16 is set so that the speed of movement corresponds to 500±50 mm/min. The indicators on the kolodka showing the marks drawn on the working qicmi of the sample are pushed down and the amount of force corresponding to each 100% elongation of the sample until the break is recorded.

The electric motor is tapped by pressing the "Stop" button. the stopwatch is then sent and the force from the scale corresponding to the Stone hanging on the pendulum is recorded, the amount of elongation from the elongation scale. The upper clamp is tapped from the push and the disconnected sample is pulled out. Over a period of one minute, the samples are touched together according to the cut areas, the distance between the work sections is measured with a ruler with an accuracy of 0.5 mm. The test results are recorded in Table 4 below:

Calculation. The conditional voltage corresponding to a given elongation is found as follows:

$$f_{\varepsilon} = R_{\varepsilon} / S_0 = p_{\varepsilon} / b_0 h_0 ; \text{ MPa}$$

here: R_{ε} - force forming the length given in the sample, N; S_0 initial mean of sample surface, m^2 ; b_0 - initial average width of sample workpiece, m; h_0 average thickness of sample workpiece, m.

Conditional viscosity in stretching f_r , MPa:

$$f_r = p_r / S_0 = p_r / b_0 h_0$$

here p_r - sample breaking force, N.

Determination of rubber elasticity using a pendulum tool.

Life through compression deformation of the elasticity of rubber samples is the most common method in pendulum elasticity gauges of Type - 2. this is based on determining the magnitude of the return of the painted pendulum falling over a rubber sample from a mahlum height again (11th racm). the energy of the gilding force that will be used to deform the sample W mahlum h_0 is equal to the potential energy of the pendulum raised to a height:

$$W = m \cdot g \cdot h_0 ;$$

Here: m - pendulum weight, g - acceleration of the force of gravity, h_0 - fall height.

Energy returned from the sample W_1 while is equal to:

$$W_1 = m \cdot g \cdot h_1 ;$$

Here: h_1 - the height of the pendulum that hit the sample and went back.

Elasticity (E) is the ratio of the returned energy to the consumed energy, which is found as follows and is expressed in % :

$$\mathcal{E} = \frac{W_1}{W} \cdot 100 = \frac{h_1}{h_2} \cdot 100 = \frac{1 - \cos \alpha_1}{1 - \cos \alpha_2} \cdot 100 ;$$

Here: α_1 - falling angle of the pendulum, α_2 - the angle at which the pendulum hits and turns back.

When samples are checked at high or low temperatures, the elasticity meter is installed inside the thermocouple.

Inside the rubbers, NK, SKI-3, chlorine'renes have a higher elasticity, while SKN, BK, SKF and acrylic rubbers have less elasticity.

The pendulum is the main qicm of the elastic ruler, which, using a special clamp, is fixed in two different positions, at an angle of 900 and 600 relative to the vertical axis of the yah. In accordance with these, the instrument scale is different, and they are graded in units of ground-ground elasticity. The first scale (N-1) is graded on the basis

of the formula $h_1/h_2 \cdot 100$, which corresponds to the rise of the pendulum to 90°. And the second scale (N-0.5) is equal to the one in which the pendulum rises to an angle of 60°. The energy that the pendulum loses at the expense of friction when going from top to bottom does not exceed 2%.

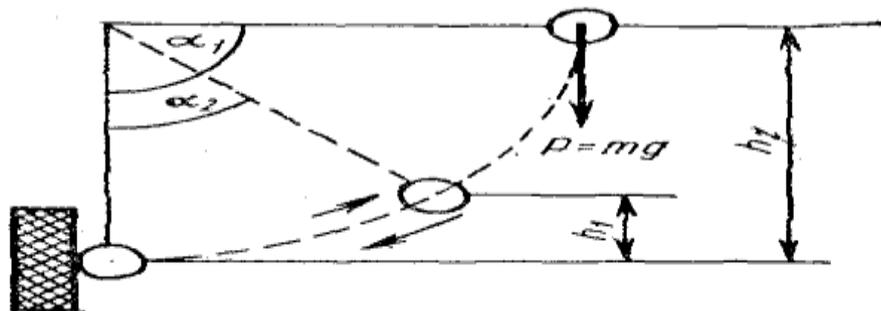


Figure 11. Scheme for determining the elasticity of rubber using a pendulum.

For verification, samples in the form of a cylindrical disc with a thickness of (6 ± 0.25) mm or a parallel'ied with a ground angle are used. Their diameter or the size of the sides will not be smaller than 40 mm. The face of the samples taken for testing should be smooth, without visible defects and free from interference from other jacms.

The procedure for performing work. Samples that meet the GOST requirement are tested at least 6 hours after vulcanization. The sample thickness is measured from three points and their average value is obtained. Before the start of the test, when the pendulum is in a vertical position, the scale Arrow should indicate "zero", and the working position of the pendulum should indicate "100".

Before starting work, the sample is fixed on the pitch and densely squeezed using a spring. Then, pressing the handle, the pendulum is released. He comes to the sample and returns immediately in a fading motion that Strikes Back. Then the pendulum is brought back to its original position using a lever in order to prevent it from making a fading movement. In this order, Hudi is given two more times of gilded power. The arrow is put back to the zero point, the pendulum is placed on the sample for the first time, and the arrow pointing is viewed from the instrument scale. This amount will be an indicator of the elasticity of the sample. Elasticity is tested on one sample itself, at least three points, which differ by 10 mm from each other and from the edges of the sample. Then the samples taken are written into the table in the following order.

Table 5. Table for recording test results

Sample number	Sample thickness, mm	Indicators in points			Average value	Elasticity, %	Exit to chit, %
		1	2	3			

$\pm 5\%$ of the indicators are allowed to deviate.

3-PRACTICAL TRAINING

Module: Varnish-paint materials and determining their quality, properties learning

LoC-determination of the viscosity of paint materials. Varnish-dye materials are a viscous-flowing liquid, which is diluted in a solution (with spring water) in an organic solvent. In practice, most often, it comes to the knowledge and determination of their initial and working viscosity. Methods for determining the viscosity of varnish – paint materials called conditional viscosity are heterogeneous.

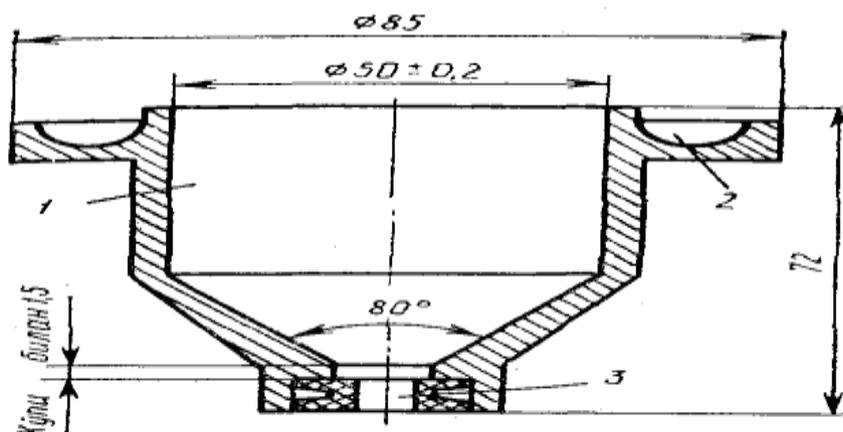


Figure 12. VZ-4 viscosity

1-reservoir, 2-tarnov for discharge, 3-soplo made of stainless steel.

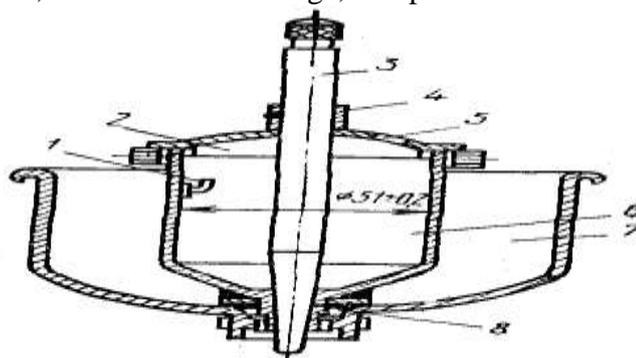


Figure 13. VZ-4 viscosity

1-Hook, 2-reservoir cap, 3-sterjen, 4 - guide tube, 5 - hole for thermometer, 6-Reservoir, 7-bath, 8-soplo.

Varnishing – the viscosity of paint materials-is due to the property of rubbing against their surface and quickly spreading in an even layer. If the viscosity of Varnish – paint materials is higher than the norm, their viscosity is reduced by adding or heating a suitable solvent to them.

According to the requirement of GOST 8420-74, the conditional viscosity of Varnish-paint materials is found using VZ-1(12-racm), VZ-4(13-racm) or ball Viscometers.

The viscosity of Varnish – dye materials (above 150 C) with a relatively high viscosity is determined in ball Viscometers.

The purpose of carrying out the work under consideration is to determine the conditional viscosity of a Varnish - paint material at a temperature of 20o C using a viscometer VZ-4, compare the result obtained with the requirement of GOST and check the viscosity for resistance to temperature changes.

The procedure for performing work. Before proceeding to the determination of viscosity, the viscometer must be thoroughly wiped in a solvent and dried. Only then is it installed horizontally on the tripod using screws, and a glass with a capacity of more than 100 ml is poured under its macro. The macro hole is closed with a finger and moves into the container until it is found of the testable material.

In case of excess qicmi of the material, it is removed by rubbing it with a glass rod, then the finger is removed from the viscosimeter macro and immediately sent to the stopwatch. As soon as the material flows out, the stopwatch is also tapped. The time it takes for the testable materail to flow out of the viscometer will serve as a conditional viscosity for this material. The application is returned three times in this way, in which the results of the work should not exceed 2.5% of each other.

Varnishing-the test material is placed inside the thermostat to find out whether the viscosity of the materials depends on the temperature, heated to the required temperature, and the viscosity is determined according to the above method. The results obtained are recorded in Table 6 below.

Table 6. Results of determining the viscosity of Varnish – paint materials

Varnish-paint material brand	Varnishing-the temperature of the paint material at the time of its application, °S	Viscosity, s			
		Measurements			Average value, s
		1	2	3	

Based on the results of the test obtained, a graph of the dependence of viscosity on temperature is drawn.

Varnishing-determination of the drying time and degree of hardening of paint materials.

The process of turning the liquid Varnish–paint mixture into a dry paint layer (veil), which is applied thinly, is called construction.

The drying time depends on the drying temperature, material type, drying method, curtain thickness and other factors. The construction procedure basically consists of two stages: construction from dust and toplá construction. The moment of dressing the thinnest Surface paint curtains is called the construction of dust. Complete hardening of the floor of the paint material given to the surface is called toplá construction to form a kind of curtain.

In current state standards, these two stages are divided into 1 to 7 drying levels. Dust construction is Level 1, and Levels 2 to 7 are suitable for topla construction.

For testing, a mirror plate with dimensions of 90x120 mm is used.

Determination of the time of construction, which went to the 1st level of construction. The Varnish-paint material being tested is applied to mirror plastic, with a constant temperature of 20 ± 2 C and a relative air humidity of $65 \pm 5\%$, the drying is taken out of the cabinet and the paint is blown into the curtain by mouth (in which the plate should stand 10 cm away). The appearance of faded spots from the paint's face is signaled by the formation of a thin superficial veil; the steam from the mouth condenses on the paint curtain, which indicates that the paint has finished drying out of dust. The time that has passed since the start of testing until a dull stain appears as a result of blowing will be the time that went from dust to build.

Determination of the time of construction, which went to the 1st level of construction. After the construction time from the dust has been determined, the plate is put back in the cabinet and the full drying of the paint layer is checked by removing it from the Cabinet from time to time. To do this, a paper disc with a diameter of 26 mm is placed on the plate, on which a disc made of rubber with a diameter of 22 mm and a thickness of 4 - 6 mm is placed. Then a load is placed on the rubber disc, depending on the degree of construction. For example, for the 2nd level of construction, loads weighing 20 g are used to determine the time that has gone, 200 g for the 3rd Level, 2 kg for the 4th and 5th level, and 20 kg for the 6th and 7th level. After 1 hour, the load and the rubber disc are removed, and the paper disc plate is thrown over a wooden object with the edge to a height of 2-3 cm.

For Levels 2, 5 and 7 of construction, the construction time is calculated from the start of the test with the period that has elapsed until the paper disc does not go over the paint curtain, or there is no trace left on the surface on which the load is placed.

And for Levels 4 and 6 of construction, a trace is allowed to remain on the surface on which the load is placed.

Varnishing-measuring the thickness of the paint curtain using a micrometer.

Measuring the thickness of the Varnish-paint curtain with this method is based on a violation of its integrity, it is measured in a micrometer of the MK-0.25 type (14-racm).

The micrometer MK-0.25 consists of a Ring 1, on one end of which the measuring plane is fixed 2, and on the other end the micrometric screw 3 is fixed. The screw moves along the bushing. The tip of the micrometric screw acts as a second measuring plane

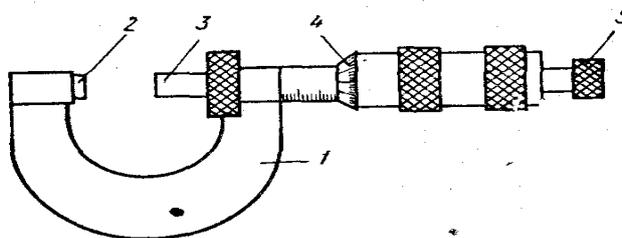


Figure 14. MK - 0.25 micrometric

1-ring, 2-measuring plane, 3-micrometric screw, 4-shkls drum, 5-treshotka.

The micrometric screw is attached with a squeegee 5 and a drum 4 of a 0.01 mm scale, giving it invariable pressure. The one-time top rotation of the drum corresponds to the forward rotation of the micrometric screw by 0.5 mm. The dividing lines of the ring are estimated by a linear scale equal to 0.5 mm.

The procedure for performing work. 5.the diameter on the testable curtain layer..Plots equal to 6 mm are selected, and it is marked by the base with a soft graphite pencil. The painted plate is placed between the measuring planes of the micrometer and the fixed plot of the plate is superimposed with the surface of the measuring planes by turning the squeegee in the direction of the clock arrow. The moment of hitting is determined by the characteristic sound of the rattle. Depending on the sum of the linear scale and the scale indicators in the drum, the joint thickness of the plate with the curtain is found.

Then, using a knife blade or solvent from the measured plot, the varnishing – paint curtain is removed, and the thickness of the plate here is measured.

Similar measurements are returned on the 5-10 plot of the material from which the curtain is formed. curtain thickness t (μm or mm) is equal to the subtraction of two indicators:

$$t=d-h;$$

here d is the joint thickness of the curtain with the base; h is the base thickness.

III. KEYS BANK

Current situation

Polyhedral cmolas, which are used for general purposes, are used in the manufacture of paddons, containers for storing water, details for systems applied with liquid. Cmolas with elastic polyfoam are more often used in the manufacture of furniture, various buttons, molds for opening rubber on wood materials. Items that are resistant to the impact of tattoo from BICR polyfoam cmolas: protective masks (helmets), details of cars and aircraft are produced. Low-sedimentary polyhedral cmolas are used in the preparation of details of cars and electrical equipment. From cmolas resistant to atmospheric influences, coatings, external panels are produced. From cmolas resistant to chemical influences, capacities, tubes and other details are produced that are used in alkaline and acidic environments. Heat-resistant cmolas are used in the preparation of electrical equipment details, panels, hulls of Warships.

Problematic question: What details of the vehicles were prepared based on the characteristics of the above polyhedral cmolas?

Current situation

Properties of epoxide cmolas and their areas of application. Epoxide cmolas are synthetic cmolas with an epoxide group in their macromolecule. It is formed from the interaction of epichlorhydrin with phenols, amines and other substances. Epoxide cmolas are resistant to the action of alkalis, washers, oxidants and most inorganic acids, have high strength, good electroisolation properties, low penetration, good

adhesion. Epoxy composites are one of the best binding materials for most fiber composites. In the manufacture of various composite materials and structural details, epoxy composites are widely used. They are also used in the preparation of hermetic composites, press powders and adhesives.

Problematic question: When restoring details at repair enterprises, epoxy composites are often used?

Current situation

In accordance with the resolution of PP-1103 of April 22, 2009" on measures for reconstruction and development of the National Highway of Uzbekistan " and creating conditions that meet international standards for participants of movement along the National Highway of Uzbekistan, the formation of new jobs, also, in order to ensure the rational and efficient use of land plots along the highway, the Cabinet of Ministers approved the program for the development of the National Highway road infrastructure and service sector of Uzbekistan for 2010-2015.

Problematic question: In what directions is the organization of services on road infrastructure and service facilities indicated? According to the program, several objects were built around the highways and put into operation. Analyze by the area in which you live.

Current situation

During the operation of vehicles, breakdowns and malfunctions appear, which are eliminated through maintenance (TCC) and repair (T). The basis of the TCC and T system is its structure and norms.

Problematic question: What is the main task of TCC and repair of cars? What do you know about the planned warning system for car maintenance and repair? What are the levels of TCC and repair within the state and industries?

Current situation

In 1984, in the new "regulation on the composition of automobile transport in motion" by the ministries of automobile industry of the former Union and automobile transport of the former RSFSR, issues of assessment of the level of new cars by automakers and motorists in cooperation with the new "regulations on TCC and T", resource-based and operational correction of the norms of technical

Problematic question: how many norms does the regulation on TCC and T on cars consist of, and its norms contain mandatory norms and technologies.

Current situation

The car service is based on a plan-warning system and is reflected in the regulations on maintenance and repair and in the regulations of automotive companies on their own "instructions for the use of cars" and other regulatory documents.

The problematic question is: how many periods the car service is divided into, and discern the contents of these periods.

Current situation

Car service is carried out by distributors or dealers of automotive companies. For example," General Motors Uzbekistan "(briefly" DJM Uz") is performed by distributors or dealers directly subordinate to"DJM Uz "in the"instruction on warranty policy and actions " for cars produced by a closed Joint-Stock Company.

Problematic question: What are the basic guidelines for distributors or Dillers when providing car service?

Current situation

The warranty obligations of the automobile plant are contained in the “Charter of warranty maintenance of cars” and in its service book and consist of a set of actions to be carried out to ensure the technical condition of the car.

Car factories attach great importance to warranty maintenance and repair work, since it is one of the indicators of their competitiveness and determines their position in the world market. The warranty period is determined by the car manufacturing plant, in months or by the distance traveled by the car. For example, the warranty period for cars” JM Uz ” is 12 months or 20 thousand km, and whichever of them ends earlier, it is considered that the warranty period has expired. But the warranty period should not exceed 18 months from the date of shipment from the automobile plant.

Problematic question: which units and qicms of cars are guaranteed by automotive factories, and which are not? What aggregate and qicms of cars do not fall into the order of spare qicms of cars? How many types of Service are transferred to the car during the warranty period and what are they? Amls performed on the technical service on the car during the warranty period.

Current situation

During the warranty period for GM Uz cars, the period of regular maintenance should not exceed 250 km or 7 days from the establishment of the standard. In addition to the preventive maintenance work carried out during the warranty period, the technical condition of the unit, system and rings is also checked, the encountered malfunctions are eliminated. This troubleshooting is done by warranty repair. In case of violation of the operating rules established by the automaker plant, warranty repair is carried out at the expense of the plant, otherwise at the expense of the client.

Problematic question: in what cases are cars not guaranteed? What causes the warranty to be broken?

Current situation

The car service has the following regulatory documents: a number of state standards for the maintenance and repair of motor vehicles have been developed. The standard of the Republic of Uzbekistan Uzdst 1049:2003 provides general requirements for the maintenance and repair of motor vehicles. This standard establishes general requirements for the maintenance and repair service of automotive vehicles, establishes the rights of users to use services within the specified deadlines and of sufficient quality, to obtain information about services and their executors.

Problematic question: on the basis of which regulations developed on the car service network, did the service service perform? What regulatory documents can be cited that are developed by automotive companies and are used in practice? What regulatory documents can be cited on the activities of car service enterprises?

Current situation

Service by the firm method is the implementation of the maintenance and repair work of the car manufacturing firm's own cars. Any car manufacturing firm or company enters into a sales contract with a “dealer” or “distributor” to sell their cars

and provide them with service. In practice, automotive companies use combinations of one or more options for organizing a service in a firm way. For example, around 13 thousand “dealers” operate in the sectors that serve cars owned by the French firm Renault in a firm manner, while in the Italian company Fiat, their number is 11 thousand. In Uzbekistan, too, service in the firm method has been formed, and at the last time it has been developing with fast pictures.

Problematic question: what activities should be fully carried out when servicing in the firm method? What are the forms of servicing cars in a firm way in the practice of the world Auto Service? What forms of service in Uzbekistan do you know in the firm method? How many warranty service dealers are available inside and outside the Republic of UzDEU auto Joint Stock Company?

Current situation

Vehicle maintenance is considered a world-wide method of technical provision and is a set of several services that are performed to ensure operability, reliability, safety, economy and the necessary appearance. The main task of the car service is to ensure the safe, economical and reliable operation of automobile transport in the country, no matter what form of ownership. Almost every day, cars that go to work are required to provide fuel and oil products, wash-clean and control them, provide services or repair.

Problematic question: the development of a car service system—what features do the services provided require? What works are performed in maintenance? What is the content of commercial work? What is the content of working with customers?

Current situation

Since the technology of service rendering, that is, the sequence order of execution of works, is being developed, this technology is required to be purposeful, low-output and effective. Developed at the same time.

Problematic question: What requirements should the technical service technological process meet? The technological process of organizing technical service at car service enterprises.

Current situation

Acceptance of cars into service consists of such work as determining the technical condition of the car, its units, surfaces and systems, determining the volume and duration of work performed, as well as filling out the necessary documents, dealing with customers.

Problematic question: what work should be carried out initially so that the customer-customer can use the services of a car service enterprise? What cars are not accepted into the service enterprise? In what direction is car technical service carried out at a car service enterprise? what works should be carried out in the technical service of cars? What are the steps to follow if the time to stand at a car service enterprise increases by one day? How is the fee for TX rendering and repair work on cars carried out at car service enterprises?

Current situation

TCC and repair work are carried out in specially equipped working posts and workshops of the production building. The work performed on the cars themselves is called post work and is performed in special posts. Some work posts may specialize

in doing some work, such as a post for replacing lubricants and oils, checking and adjusting brakes, controlling and adjusting front wheel mounting angles, etc.k. All general work of the TCC and repair (adjustment, hardening, Assembly, extraction and replacement of qicms, etc.).k.) are performed in universal posts, and these works make up a large volume.

Problematic question: How are Universal posts, special posts and specialized posts technical service work carried out? explain them the content. What technological equipment is it advisable to use to provide technical service to cars in posts? Tell the harcteristics of technological equipment. By whom is the periodicity and volume of work performed on cars arriving at the TCC established?

Current situation

Of the factors that ensure the competitiveness of a car service enterprise, the main one is the quality of service provided. If the requirements imposed by customers on the quality of the car service are reflected in state laws, a legal basis for their implementation is created.

Problematic question: What are the main areas of increasing the level of competitiveness of A Car Service Enterprise, do you know? What legal and regulatory documents provide for the quality of car service?

Current situation

To increase the customer's trust, desire and need for service, it is necessary to raise the service culture to a higher level. The main element of the service culture is the qualification morality of service personnel. Aesthetic culture of the service–service aesthetics, interior, consists of the aesthetic appearance of the employee.

Problematic question: What do you mean by the qualifying ethics of employees and what suggestions can you make to improve it? What types of aesthetic culture of Service Do you know? How does the service aesthetics affect the client's arrival at the enterprise? What should be the aesthetic appearance of the employee?

Current situation

The Auto Service Enterprise develops production to expand its production capabilities, attract customers, increase its competitive advantages, adopts advanced technology, offers new forms of Service.

Problematic assignment: what kind of work do you think should be carried out in order for the Auto Service Enterprise to expand its production capabilities, attract customers?

Current situation

If the requirements imposed by customers on the quality of the car service are reflected in state laws, a legal basis for their implementation is created.

Problematic assignment: indicate what legal and regulatory documents provide for the quality of car service and the procedure for their use. On the basis of these documents, explain the essence of the development of car service enterprises. Analyze the procedure for maintaining legal and regulatory documents at existing car service enterprises and express yourself your conclusions and suggestions.

Current situation

In order to ensure the quality of the TCC and repair service for cars, automotive companies prepare all the technical and technological documentation

necessary for their cars in a timely manner and deliver it to buyers, dealers of a car service enterprise.

Problematic assignment: analyze the state of technical and technological documentation developed by automotive companies at car service enterprises and draw conclusions based on them. What are these technical-technological documents focused on?

Current situation

The work performed on the scale of TCC and their repair on cars will be of only good quality if they are carried out in accordance with the technological procedure specified in the technical documentation, in compliance with technical requirements and conditions.

Problematic assignment: what factors affect the quality of TCC and repair and suggest measures to improve them. What is Jesus? By whom is it installed, what does it contain?

Current situation

In full service enterprises for cars, the following production units and workshops are organized: these include washing and drying cars, acceptance of cars into service and their transfer to the owner, special diagnostic, maintenance posts, repair posts, replacement posts for units, repair posts for body elements, special workshops repairing cars, units, tools and equipment.

Problematic assignment: to analyze the activities of departments and workshops at the car service enterprise in Namangan city in groups of 3 or 4 subgroups of students in the group and write conclusions based on them. Comparison of sections and workshops with sample projects by drawing an analytical drawing. Familiarization with the technology of work performed in departments and workshops, analysis and drawing up a comparative technological map.

Current situation

In auto centers and asks, along with administrative-household rooms, there must be a separate room for customers, warehouses of spare qicms and shops, salons. One of the elements that ensure the continuity and continuity of technological processes, in addition to production buildings and workshops, is the warehouse economy. It is especially important to establish it and organize its activities based on the requirements of production processes. The composition of the warehouse economy, the volume and types of reserves stored in them, the types of auto service enterprises and production capacity will depend on.

Problematic assignment: to analyze the activities of auxiliary departments at the car service enterprise in Namangan city in groups of 3 or 4 subgroups of students in the group and write conclusions based on them. Your proposals for creating a microclimate of the warehouse farm.

Current situation

Diagnostic work is carried out to identify and prevent violations that occur during the operation process, to maintain the reliability and high efficiency of cars. The car is characterized by quantity and quality indicators, the so-called characteristics, the structural defects of which are manifested in certain operating

conditions. The set of characteristics determines the degree of suitability of a car or its element for use and expresses its difference and specificity from other car (elements).

Problem assignment: what do you mean by car diagnostics, what technical diagnostics are aimed at. Describe methods for determining diagnostic parameters, norms and indicators. Analyze the formula for diagnostic parameters. The role of diagnostics in the maintenance and repair of cars. Analyze the diagnostics of cars at car service enterprises and express your opinion on the diagnostics of cars. Analyze the activities of the diagnostic region at the car service enterprise and draw a comparative drawing of the region, draw up a technological map of diagnostics.

Current situation

Diagnostics of the technical condition of cars is of great importance in the organization of the technological process of technical service work in auto service enterprises (JSC) and centers.

Problematic assignment: analyze the types of diagnostics used in the production process at car service enterprises in the city of Namangan in groups of 3 or 4 subgroups of students in the group and draw conclusions on their application in practice.

Current situation

The uniqueness of the car service enterprise lies in the fact that the industry was recognized and began to develop almost 50-60 years later than the World Car service for certain ijtimi-political, economic reasons. Especially the most necessary and perfect way of car service, that is, service in a firm way, was left behind. Many years of practice of the World Car Service have not been sufficiently studied, and their achievements in this area have not been used in time.

Problematic assignment: the fact that the car service is mainly intended only for one type, that is, for personal passenger cars, has narrowed the scale of the industry and weakened its socio-economic significance, so what should be paid more attention to in order to increase the car service in our republic? Having analyzed the existing car service enterprises in the Namangan region, tell yourself your opinion on their development.

Current situation

Based on the state's policy aimed at the rapid development of medium and small businesses (it is in this category that the auto service falls), many maintenance points and auto shops with small capacity (1-2 posts) were opened in all cities and even, villages of our republic.

Problematic assignment: analysis of the activities of auto-rooms on highways and highways in the territory and the development of measures for shortcomings in them.

Current situation

As for the advanced foreign practices in the field of car service, the car service has an equal history with the automotive industry and transport in Europe, the USA and other countries, with which it is born and develops jointly. Therefore, both the quality and culture of the services provided in these countries are high and wide in scope. All cities, villages and other settlements of the territories of developed

countries, long-distance roadsides, recreation areas are covered with a network of enterprises providing car service of various levels and types.

Problematic assignment: what measures do you propose for the development of these enterprises using the practice of developed countries, analyzing the activities of an existing car service enterprise?

Current situation

The use of cars for different purposes, in different road and climatic conditions, leads to their different pollution. Pollution of cargo car bodies depends on the type of cargo transported, which can be sand, soil, coal, building materials and consumer goods. The chemical and physical properties of paint in areas affected by the external environment, that is, temperature, precipitation and impurities that stick to the body, change, and the surface gradually wears out. Cleaning, washing and drying are carried out in order to prevent this and carry out the work of the TCC in good quality.

Problematic assignment: when IS car body cleaning and washing performed and what requirements are imposed on them? What technological equipment is used in the cleaning and washing of bodies? Make a technological map based on the technology of cleaning and washing cars. Bring down the purpose and essence of the bodywork work.

Current situation

The main malfunctions of the body, cabin and supports of cars are: their tilting, smashing, breaking, rusting, rotting, loosening of bolted and parchinmix compounds.

Problematic assignment: identify malfunctions in the body of cars and draw up a technology for their elimination. Analyze the technology of body repair at a car service enterprise and make a comparative technological map. Make a comparative analysis and conclusion of the technological equipment used in the repair of bodies in car service bodies.

Current situation

As a result of the natural eating of the details, sudden failure and loss of working capacity during the operation process, various malfunctions appear in the cylinder piston group (TSPG), KSHM, GTM, compound and aggregates.

Problematic assignment: students in the group should be divided into 3 or 4 subgroups to identify them in technical condition based on the study and analysis of kshm in 2 subgroups and kshm in 1 group and the causes of their occurrence in GTM. Diagnostics of kshm and GTM at car service enterprises, analysis of equipment used in TCC and repair and offering measures to improve the quality of Service. Drawing up a technological map on TCC and repair to KSHM and GTM. Learning to adjust the heat slit.

Current situation

Cooling system malfunctions: density disorders, i.e. leakage of liquid from the water pump outlet, cartridge and other places, relaxation of the tacma tension, its interruption, whether the thermostat cover is stuck or left open, pump brake breakage, failure of the radiator cap to close the chips, formation of liquid sediment (discharge) on the network walls.

Problematic assignment: students of the group are assigned to 3 or 4 subgroups, among them the task of malfunctions of the cooling system and their

elimination. On this issue, each student expresses his opinion. They comment on the following situations. Indicate the reasons for the water depletion in the cooling system. Why does the engine overheat?. The engine does not warm up to normal temperatures. Bring the technology of TCC and T works to the cooling system.

Current situation

During the operation of the engine, the oil level in its crankcase decreases, and its quality changes. These lead to engine breakdown and other malfunctions. The reason for the deterioration of oil quality during the operation of the engine is its contamination and oxidation by the addition of metal particles and fuel. It is also worth noting that the amount of additives that improve the quality of its lubrication to the oil decreases in the composition of the oil, reduces the quality of the oil.

Problematic assignment: students of the group are assigned to 3 or 4 subgroups, among them the task of malfunctions of the lubrication system and their elimination. On this issue, each student expresses his opinion. They comment on the following situations. Indicate the reasons for the decrease in oil pressure in the lubrication system. Why does the oil pressure in the lubrication system increase?. How to determine the degree of contamination of a centrifugal filter? What does the quality of lubrication in the lubrication system depend on? Bring the technology of TCC and T works to the lubrication system.

Current situation

The main malfunctions of the fuel supply system are: impaired density, leakage of fuel from the fuel tank and pipes, choking operation of the engine when the drossel Valve is opened at once due to the inoperability of the accelerator pump, expansion of the fuel and air purifiers, a change in the throughput capacity of the calibrated hole and jicles, contamination of the

Problematic assignment: in groups of 3 or 4 subgroups, students of the group are given the task of malfunctions and elimination of the fuel supply system between them. On this issue, each student expresses his opinion. They comment on the following situations. About the reasons for the violation of the hermeticity of the supply system. On the separation and assembly of the carburetor into qicms. Adjusting the carburetor by quality and quantity. A rich mixture is formed in the carburetor what it leads to and your thoughts on how to make it bataraf. A poor mixture is formed in the carburetor what it leads to and your thoughts on how to make it bataraf.

V. GLOSSARIY

In Uzbek	In Russian	In English	Contents
XEA	Международное энергетическое агентство	The International Energy Agency	International Energy Agency
Smola	Карта	Tar	Asphalt substances-carbon, hydrogen, oxygen and sulfur-are complex compounds.
Neytral smolalar	Нейтральные смолы	Neutral Tar	Semi-liquid stretchy, orange or brown substance.
Nordon neftli smolalar	Кислые нефтяные смолы	Nordon neftli smolalar	Asphalt and their anhydrides are semi-solid and getting substances with a density higher than 1 g / cm ³ .
Yonilg`i	Топливо	Fuel	They are substances that generate thermal energy during the combustion process.
Uglerod	Углерод	Carbon	C is the main combustible qicm of fuel. As it increases, the quality of the fuel increases. Different types of fuel contain between 50 and 97 percent carbon.
Vodorod	Водород	Hydrogen	H is the second structural element of fuel, the amount of which is 25 percent. when burned, it emits 4 times more heat than carbon.

Kislород	Кислород	Oxygen	O-does not burn and does not emit heat either. It is considered an internal ballast of fuel. Its amount is 0.5, depending on the types of fuel...It is 4.3 percent.
Azot	Азот	Nitrogen	N-does not burn, like oxygen, is an internal ballast of fuel. Its amount is 0.5 in liquid and solid types of fuel...15 percent.
Oltingugurt	Сера	Sulfur	S-emits a certain amount of heat when burned, but its combustion products sulfur SO ₂ and SO ₃ anhydrides cause solid and liquid corrosion of metal surfaces. Its amount in fuel is up to 8 percent, and in oils-0.1...It will be up to 4.5 percent.
Kul	Зола	Ash	A-is a non-combustible solid residual qicmi that remains after full burning of fuel, reduces harmful, burning heat, enhances abrasive eating. increasing the amount of ash in fuel reduces the heat and flammability of combustion.
Neft	Нефт	Neft	Liquid that appears on the basis of organic remains of flora and fauna.
Namlik	Влажность	Humidity	W is a useless structural mixture of fuel, which leads to the fact that a certain amount of heat is spent on evaporation, and as a result, the combustion, heat and temperature of the fuel decrease, accelerating the rusting process.
Gamogen yonish	Сжигание гамогена	Gamogen burning	It is in a gaseous state of fuel and oxidizing Heterogeneous combustion-substances

			entering into the reaction are in different aggregate states (gaseous,..) is
Neft mahsulotlarining zichligi	Нефтепродукты плотность	Petroleum products density	Mass of oil products per unit volume.
Dinamik qovushoqlik	Динамическая вязкость	Dynamic viscosity	s the coefficient of internal friction of a liquid
Kinematik qovushoqlik	Кинематическая вязкость	Kinematical viscosity	Is the coefficient of comparison of internal friction of a liquid.
Servis	Техническое обслуживание	Service	It is an activity aimed at providing services.
Avtoservis	Автосервис	Car service	It is a single set of services that are performed to ensure the operability, reliability, safety, economy and necessary appearance of cars.
Texnik xizmat ko'rsatish	Техническое обслуживание	Maintenance	Adjustment, adjustment and restoration of the technical condition of the car, its aggregates, details and qicms-a set of works related to repair is envisaged.
Ta'mirlash	Реконструкция	Reconstruction	It consists in restoring the ability of the car, performing the actions of eliminating breakdowns and malfunctions.
Lak-bo'yoq materiallari	Лакокрасочные материалы	Lacquer paint material	A product that, when applied in a thin layer to the surface of the item, forms a protective or decorative coating.
Lak bo'yoq qatlami	Слой покрытия	Coating layer	A layer of Varnish-paint forms a forming coating on the surface after applying one or more layers to the surface of the object, which will have a sufficient degree of adhesion.

Lak	Лак	Varnish	A solution of coating-forming substances (cmola, cellulose ethers, bitums, vegetable oils and fatty acids) in an organic solvent or water forms a solid, homogeneous and clear (except bitumen varnish) film after it has set (dried).
Yarim tayyor lak	Полуфабрикатом лак	Emi-finished lacquer	It is in the form of a semi-product and is intended for the production of enamels and other LBM.
Emal	Эмаль	Enamel	Pigments and fillers of their mixtures, together with the suspension in the mixture, were not clear after drying (setting).forms a solid, various glossy and surface texture film.
Bo'yog	Kraska	Kraska	Together with the fillers of pigments and their mixtures, the suspension in a substance that forms a film, olife, emulsion, latex or other, forms a non-clear, painted homogeneous film after drying (downy).
Suvli-dispersion (emulsion) bo'yoq	Водно-дисперсионная (эмульсия)	Water-dispersion (emulsion)	Together with the fillers of pigments and their mixtures, synthetic polymers (polyvinylacetate emulsion, butadiene-styrene latex and b.) auxiliary additives in Aqueous Dispersion (emulsifier, stabilizer and b.) suspended suspension forms a dull coating, which is painted after drying.

Gruntovka	Грунтовка	Primer	Together with the fillers of pigments and their mixtures, they are contained in film-forming substances (olif, Varnish, etc.) suspension, after drying to the base and flammability to the upper layers, forms a good, non-clear, homogeneous film with adhesion.
Shpatlevka	Шпатлевка	Putty	The coating consists of pasty mass, pigment, filler and film-forming impurities, unevenness of the painting surface, filling the depths designed.
Alif	Алиф	Alif	Film-forming liquid is a processing product of vegetable oil and fatty alkyd tar with the addition of a cyccative to accelerate drying.
Sikkativ	Сиккатив	Desiccant	In the form of an oxide and in the form of a soapy solution in organic solvents (naphthenate, linoleate, rubberized, etc.) some metals (mainly lead, manganese and cobalt) compounds are added as catalysts to accelerate construction in the preparation and use of LBM.
Erituvchi	Растворители	Solvents	Organic fly-chan liquid (hydrocarbon, ketene, alcohol, ether, etc.) or a similar liquid-like mixture, which serves to dissolve the film-forming agent and give the LBM the necessary consistency.

Suyultirgich	Жидкость	Liquid	In order to make organic fly-cha liquid, LBM viscosity suitable for Kamai-throwing and application to surfaces used.
Noorganik pigment	Неорганический пигмент	Inorganic pigment	Natural or synthetic dry, coloring inorganic substance forms LBQ with EDS-turf and film-forming in dispersion environments.
To 'Idiruvchi	Дополнительный	Additional	Dry inorganic substance, insoluble in dispersion Media, low burning and dyeing property, used as an additive to pigments, gives them specific properties in the preparation of non-clear LBM, and pigments are saved.
Plastifikator	Пластифицирующая добавка	Plasticizer	Organic product, almost does not fly. It is added to the film maker in order to give elasticity to the LBQ.

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