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INVESTIGATION OF WATERPROOF GLUE COMPOSITION

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The production of packaging products in various industries is associated with the use of materials such as paper, cardboard, micro-corrugated cardboard, corrugated cardboard, glass, fabrics, foil, polymeric film materials and others. Glues of casein composition are used for polymeric materials and containers of different composition (glass, PET).

The use of water-based adhesives solves many problems of resource and energy conservation, as well as environmental protection. In the process of bonding, casein adhesives may lose their ability to dissolve or soften during heating, so their use when labeling leads to complications when washing them off the container when they are reused. The need for easily washable adhesives arises when labeling products packaged in glass containers. Such adhesives have the most stringent requirements - the ability to hold the label on the bottle, including in conditions of high humidity. The adhesive should allow easy separation of the label from the bottle when washing it with harmless liquids, most often aqueous solutions of soda or surfactants.

During the life cycle, the bottle can be affected from the outside: when stored together with finished goods, in retailing, during transportation, in the refrigerator or during washing. Any label is a subject to a variety of influences, such as changes in temperature and environmental conditions, humidity and mechanical action. Therefore, the adhesive should have a wide range of technological and operational properties (the label should not be separated from the bottle under the action of condensate, but should be easily washed off in a dishwasher).

Adhesives must meet such requirements as resistance to condensed water and resistance to ice water at 3-5 ° C. Removal of the label in the washing machine, as a rule, takes place at temperature of 70-80 ° C with the addition of NaOH (high pH) or surfactants.

The preparation of the glue was in the following sequence: water of 60 wt % at temperature of 20-25 ˚C together with stearic zinc of 0.1 wt. % and the defoaming agent were poured in a vessel with a capacity of 500 ml. This mixture was aged for 10-15 minutes in a water bath. After holding the mixture at 25 ˚C modified starch of 3.5 wt % was added to it with constant stirring. After keeping for 15-20 minutes at the temperature of 20-25 ˚C casein of 18 wt. % was added, and then the mixture was

kept for 30-40 min. at the temperature of 25-30 ˚C. Then butyl of 0.3 wt. % and ethyl alcohol of 2.2 wt. % were added, followed by the addition of urea of 10 wt. %, and kept at the same temperature of 25-30 ˚C for 5 min. and 15 min. correspondingly. After adding storm of 3.0 wt. % the mixture was heated to 82 ˚C and constantly stirred for 10-15 min.. The next step was cooling the mixture to 40 ° C and adding of 2-naphthol. The finished adhesive was divided into 3 portions, each of which was modified with the addition of mercury rosin glycerin ester (MRHE) in the following proportions: 1%, 2%, 5% at 75 ˚C. Each of them was constantly stirred for 20 min.. Then the adhesive was cooled to the temperature of 35° C. It was then filtered through a sieve with a cell diameter of 0.8-1.0 mm and poured into a container.

The test was carried out in the laboratory at the temperature of 25 ° C and a relative humidity of 85%. These parameters were monitored continuously throughout the test. The wet bottles were cooled to 4.5 ° C. Inside the bottle there was distilled water at 2 ˚C. Previously, the adhesive layer was applied to the labels with the layer of adhesive equal to 100 microns, which guaranteed the reproducibility of the specified thickness of the adhesive layer, then the labels were glued manually. The test was conducted for 6.5 hours under constant conditions. The result was evaluated with the state of the label and the turbidity of the water that came out from under the label. At the end, the test results were compared with the documented values for these practical test conditions. According to the methodology, the casein-based adhesive composition with MRHE content of 2% was tested. The label did not fall off the bottle.

The low bottle spill temperature as well as the high humidity in the bottling and storage area results in considerable condensation, as if evaporation from the bottles occurred. As a result, labels can be distorted, shifted, and in some cases, when washed with glue, they fall from the bottles. Along with the adhesive, the properties of the material of the label have a significant effect on the resistance to ice water, since they can change not only because of the "dissolution" of the adhesive layer, but also due to the loss of adhesion of the glue to the paper.

SAB Miller method was used to test the adhesive composition for ice water resistance. In accordance with the methodology of conducting and evaluating the results, the developed adhesive composition has been tested. The label remained on the bottle after being in ice water for 12 hours and been continuously rotated on the bottle back and forth 180 °.

According to SAB Miller method, the bottles are placed in ice water at the temperature of 4 ± 2 ° C for 24 hours. The bottles are rotated back and forth 180 ° every 3 hours. The bottles are then pulled out from ice water, and it is manually checked whether the label is offset or not. If it remains in place, the test is considered to have been completed. In accordance with this method, the required resistance to ice water should be more than 12 hours.