DIAGNOSIS OF ADHESIVE COMPOUNDS USED IN PRINTING EQUIPMENT

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Wide use of adhesive joints in modern technology, in particular when connecting parts and units of printing equipment, makes the issues of intensification of gluing processes and improvement of the quality of adhesive joints urgent. Currently, the improvement of the gluing process is carried out by chemical modification of adhesive compositions and the surface of the glued materials, which is based on increasing the reactivity of glues, hardeners and initiators. And also by physical modification - by influencing glues by physical and physico-chemical methods, which includes thermal effects, various types of radiation and vibration, including ultrasound.

The methods of thermal exposure based on the acceleration of chemical and physical processes at an increase in temperature have become the most widely used in practice. One of these methods is infrared heating. The strength of gluing with infrared heating is not lower than with convection hardening, and the acceleration of chemical reactions between the components of the glue, which occurs as a result of increased fluctuations in chemical bonds. Due to the use of infrared heating (compared to hardening in a thermal cabinet), the hardening time for parts glued with BK-50 film glue can be reduced by two times with the same strength.

Direct electric heating, which consists in the passage of an electric current through a package with metal meshes and adhesive "spacers" (films) with BK-50 glue, during the manufacture of heat exchange devices, made it possible to reduce the gluing

pressure from 1 to 0.1 MPa and shorten the hardening time compared to gluing in a thermal oven. The use of new gluing technology made it possible to improve the quality of finished products while reducing energy and labor costs.

One of the important methods of improving the quality of adhesive joints and speeding up the gluing process is induction heating. The parts to be glued together are heated due to the introduction of induction currents inside the material using high-frequency generators, the frequency and power of which are selected depending on the type of metal, the mass of the material and the dimensions of the surfaces to be joined. At higher frequencies, heat can be released on the surface of the glued parts, at low frequencies (for metals) deeper heating is observed.

We conducted research on the ultrasonic method of forced oscillations (resonance method) in order to determine the operational capabilities of the method in diagnosing the strength of glued structures used in the printing industry, as well as investigated the areas of application of the method in detecting defects of the non-gluing type. The resonance method is practically the only method currently used to diagnose the strength of adhesive joints. In recent years, in connection with the change in gluing technology in order to obtain high adhesive strength of adhesive joints (for example, in terms of surface preparation by anodizing aluminum alloy parts not in sulfuric, but in chromic or phosphoric acids), the possibility of a more successful application of the ultrasonic resonance method for diagnosing the strength of adhesive joints. At enterprises in the industry, the resonance method is used for defectoscopy, that is, to detect defects of integrity violations, as well as in some cases to detect areas with greatly reduced bonding strength. The resonance method is based on the excitation of elastic vibrations in the controlled material (or its part) and the analysis of the vibration parameters of the transducer-material system at or near resonances.

We have considered the mode of operation of the resonant device during movement (repositioning or smooth movement) of the piezo transducer on the surface of the material moistened with the contact liquid. Studies of the operational capabilities of the ultrasonic resonance method for assessing the cohesive strength of adhesive joints were conducted. It has been experimentally proven that a fairly reliable correlation between the strength and the reading of the device is observed when certain requirements for adhesives and gluing technology are met:the adhesive strength of the adhesive joints must be higher than the cohesive strength; temperature and exposure time during gluing must be strictly maintained; the mass of glue applied per unit area of the glued surface must be within tolerance.

If these requirements are not met, determining the cohesive strength of adhesive joints in multilayer materials using the ultrasonic method of forced oscillations (resonance method) is not effective.