

REPAIR OF CRACKS BASIC PARTS OF ROAD CONSTRUCTION MACHINES WITH ADHESIVE TECHNOLOGY

Zorin V.A¹, Baurova N.I.², Kireev V.A³

¹Doctor of Technical Sciences, Professor, ²Doctor of Technical Sciences, ³Undergraduate
Moscow State Automobile and Road Technical University (MADI)

Abstract: The properties of adhesive materials used for sealing holes and cracks of body parts of road construction machines are considered. As discussed adhesives epoxy group, acrylate adhesives, hot melt adhesives, their classification depending on the size of the crack and reviewed their technological and mechanical characteristics are considered.

Keywords: Road construction machines, glue, repair, crack, case details.

Housing parts road construction machines, generally have the greatest period of operation, which is associated with high cost and a relatively low damageability (except for emergency situations). Typical damage to the body parts of construction machinery are holes and cracks associated with corrosive whether fatigue damage [1, 2]. The size of these lesions may vary over a considerable range, from a few millimeters to tens of centimeters.

The aim of this work is to conduct a comparative analysis of adhesive materials of different chemical nature that have received the most widespread in the repair of body parts manufacturing road construction machines.

For convenience of comparison, all glue materials are divided into five groups. As a classification sign – the extent of defects of road-building machines which can be eliminated with use of this material is used. Some of brands of domestic glue materials which gained the greatest distribution at seal of cracks in case details [3] are given in table 1 and can be used at repair of road construction machines. Now there is a set of analogs, however, the brands of glues specified in table 1 are the most typical representatives in the groups and on this reason and are chosen for carrying out the comparative analysis. All set of glue materials of other chemical nature (polyurethane, kremniyorganichesky, phenol formaldehyde) in repair production are used is very limited and therefore are not included in table 1.

The comparative analysis of properties of these glue materials was carried out on two types of indicators: technological effectiveness and warm and mechanical characteristics (table 2). As indicators of technological effectiveness the following characteristics are used: quantity of components, a period of storage in a ready state, temperature and time of hardening. Such quality indicator as a possibility of introduction of a filler is also carried to characteristics of technological effectiveness. Such requirement arises in need of essential increase in viscosity of glue to prevent his effluence or running off from the restored surface.

As warm and mechanical characteristics values of adhesive durability at shift at the room temperature were used, the top and lower intervals of working temperatures.

Analysis of data in table 2 shows that no adhesive material, which would in all their characteristics superior to all others.

For example, such parameters processability as component count and viability, acrylate and thermoplastic adhesives have the same properties. But acrylate adhesives cure at room temperature, whereas the elevated temperature required to melt thermoplastic adhesives. At the

same time, the duration of the curing process for acrylate as well as to epoxy adhesives is 24 hours, whereas for the hot melt adhesives it will not exceed ten minutes [4]. Thus, the choice of one of these two types of adhesives must be carried out either by the criterion - the duration of adhesion or temperature. Selection of the most important criteria is up to the designer. Epoxy adhesives (not just those that are listed in Table 1), but all the others, in terms of adaptability significantly inferior to the hot melt adhesives, however, they are superior to them in strength parameters and heat [4-5].

Hot melt adhesives as compared to the epoxy acrylate, and particularly, have high viscosity and thus poor impregnation properties, which prevents their use in conjunction with any reinforcing plates.

It is widely used in small-scale production of the repair of body parts of road construction machinery group received like plaster epoxy adhesives, which are called «cold welding». A distinctive feature of these materials is their very good processability, since they are delivered to the consumer in the form of a single component and its consistency, reminiscent of plasticine. Hardener placed inside the main component (resin). The mixing of components is carried out manually by mashing. This technological feature in many ways, and is the cause of poor quality of the adhesive material. Using this type of adhesives is only suitable for single production, since the cooking (mixing) of adhesive is performed individually for each defect and, even in this small-scale production would require time-consuming[6].

Adhesives marks VK-9, VK-25, K-115 and CMK-5 belong to the group of multicomponent epoxy adhesives which cure occurs at room temperature. The viscosity of these materials (without filler) low, allowing their use in the manufacture of tires and lining sealing of large cracks and holes of body parts of road construction machinery. High adhesion to various surfaces, can be used as a material for tires, metal mesh, carbon cloth, and glass.

Generally, in the preparation of the metal surface to spray glue limited degreasing using acetone. However, this training does not provide quality treatment and to delete only the dust and dirt from metal surfaces. Traces of oil and rust at such purification is not removed [5, 7]. To improve the adhesion strength can use different primers, but in such process technology repair process duration is doubled, since the drying time of soils usually commensurate with the time of curing the adhesive material.

Thus, the choice can not be recommended for the repair of cracks and holes of body parts of road construction machinery of any one type of adhesive materials. Selection of repair material should be made subject to a number of technological and operational indicators.

Table 1. The brands of domestic glue materials used for seal of cracks and holes in case details of road construction machines

Sizes of holes, mm	Chemical basis of glue		
	Epoxy	Akrilatnye	Thermoplastic
to 1 mm	K-115, CMK-5	AN-1y, AN-8K	Aren't used
to 5 mm	K-115, CMK-5 withfiller	AN-8K, UG-7 withfiller	Aren't used
to 10 mm	plaster epoxy adhesives, VK-9, K-300	AN-8K, UG-7 withfiller	Hot Melt Adhesives
to 50 mm	VK-9, K-300 withfiller	Aren't used	Hot Melt Adhesives
more 50 mm	VK-9, VK-25, K-300 withfiller	Aren't used	Aren't used

Table 2. The properties of glue materials used for seal of cracks and holes in case details of road construction machines

Indicators	Chemical basis of glue		
	Epoxy	Akrilatnye	Thermoplastic (Hot Melt Adhesives)
Characteristics of technological effectiveness			
Quantity of components	1...3	1	1
The viability of the adhesive in the finished form, hour	0,5	Not limited	Not limited
Shelf life of glue or its components, year	1	1	1
Curing modes: - Temperature °C; - Time, hour	22...24 24	22...24 24	90...200 0,1
The possibility of combining with dispersed fillers	yes	yes	no
The possibility of combining with fiberfill	yes	no	no
Thermal and mechanical characteristics			
Tensile shear strength, MPa	15...25	–	2...10
Tensile strength at the axial shear, MPa	–	30	–
Operating temperature range, °C	-60...+150	-30...+150	-20...+(60-90)
Relative extension, %	<1	1...5	10...50

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