THE USE OF INNOVATIVE BITUMEN-BASED PRODUCTS AT PERFORMING TREATMENTS TO IMPROVE THE QUALITY OF ROAD SURFACES

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Rezumat. *Structurile rutiere sunt proiectate si realizate astfel incat sa reziste in bune conditii, pe intreaga durata de exploatare, solicitarilor din trafic si actiunilor factorilor hidrologici si climaterici. Dintre imbracamintile rutiere moderne aplicabile, cele bituminoase sunt cele mai raspandite datorita avantajelor pe care le prezinta din punct de vedere al posibilitatilor executarii unor consolidari succesive pe masura cresterii solicitarilor din trafic, confortului oferit utilizatorilor, conditiilor mai bune de intretinere si exploatare, costului etc. Imbracamintile rutiere bituminoase sunt imbracamintile in compozitia carora se foloseste bitumul. Produsele analizate se utilizeaza cu succes, in principal pentru repararea imbrăcămintilor rutiere asfaltice degradate si asigura o etansare completă a suprafetei, stabilitate la temperaturi inalte, flexibilitate la temperaturi joase, aderentă bună datorită stabilităţii la deformare, elasticitate superioară si rezistentă la intindere si eliminã disconfortul in circulatie, disconfort datorat denivelărilor sau exfolierilor.*

Abstract. *The road structures are designed and built in such a way that they can withstand traffic demands and the actions of hydrological and climatic factors in good conditions, for the entire duration of operation. Among the applicable modern road surfaces, the bituminous ones are the most widespread due to the advantages they present from the point of view of the possibilities of executing successive consolidations as traffic demands increase, the comfort offered to users, the better conditions of maintenance and operation, the cost, etc. Bituminous road clothing is the clothing in the composition of which bitumen is used. The analyzed products are used successfully, mainly for the repair of degraded asphalt road surfaces and ensure a complete sealing of the surface, stable at high temperatures, flexibility at low temperatures, good adhesion due to stability to deformation, superior elasticity and resistance to stretching and eliminate discomfort. circulation, discomfort due to bumps or exfoliation.*

Keywords: asphalt mixture, treatment, road infrastructure, degradation, bitumen, roughness

1. Introduction

The development of industry leads to an increase in the volume of products that must be transported from the place of manufacture to the user. At the same time, those who participate in the manufacturing process of goods must travel from their own home to the place of production.

The necesity to transport goods and people leads to the use of existing roadways and the construction of new ones. In this sense, it is known that the most used

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material for coverage of roadways is asphalt. During the exploitation of road traffic routes, they are subject to the influence of environmental factors, such as ultraviolet radiation, humidity, acids and saline solutions, which over time produce chemical changes in its composition, more precisely in the oxidation process that leads to the loss of elasticity and initials properties. The wear of road surfaces over time has adverse effects on their lifetime. This reality imposed the study of innovative materials, with the role of protecting the surface of the roads in order to extend their lives. [1]

In a first stage, INCERTRANS S.A. in collaboration with ROMIS TL 2004 S.R.L Brașov, have performed laboratory tests to show the behavior of these materials to the traffic requests that generally lead to the appearance of degradations that have the effect of reducing the duration of life span and finally, the destruction of the entire road system.

As a result of the favorable results obtained in laboratory conditions, in situ experiments were carried out with the investigated products in order to track the behavior over time of the solutions to protect the surface of the roads studied.

2. The experimental part

The experimental part included 2 (two) stages: the first stage consisted of performing laboratory tests, and the second stage consisted of performing in situ experiments on road sectors chosen both in the conditions of national roads and in the conditions of traffic in the environment urban.

2.1. Laboratory studies

As part of the laboratory studies, tests were carried out on samples of asphalt mixture type BA16 rul 50/70, as well as samples of asphalt mixture type BA 16 rul 50/70 together with the product based on bitumen and aggregates anrobate.

The wheel tracking test (to the formation of the rut depth) was considered as a significant experimental test. It is known that the rut depth is the permanent longitudinal deformation of the road structure, characterized by a subsidence of it under the effect of repeated demands from traffic.[2]

The results of this laboratory test were presented in the work "Studies and researche on the development of innovative products based on bitumen: CARGOSFALT UV (THERM), CARGOSFALT T (TREATMENT), CARGOSFALT A (ADDITIVE) for the purpose of extending the life of road infrastructure works made from asphalt mixtures or cement concrete".

For this, test conditions similar to those found in high temperature areas have been created. The test was carried out using a system containing both the influence of sunlight and high temperatures. To be able to reach a conclusion, the results of a

wheel tracking test on an asphalt mixture of type BA 16 rul 50/70 at a temperature of 70°C, without its treatment with the innovative bitumen-based products, were compared, as well as performing the wheel tracking test on asphalt mixture type BA 16 rul 50/70 with the product CARGOSFALT UV (THERM) under the same conditions, under the influence of UV rays and a temperature of 70°C.

As a result of the comparison of the obtained results, it was found that the asphalt mixture type BA 16 rul 50/70 with the CARGOSFALT UV (THERM) product has a better behavior than a simple asphalt mixture type BA 16 rul 50/70. [3]

2.2 In-situ experimental studies

The product CARGOSFALT, a regenerant product, is used with success mainly for repair of degraded asphaltic or cement concrete road surfaces and provides a complete surface sealing, high temperatures stability, flexibility at low temperatures, good adhesion due to its stability to deformation, elasticity superior and tensile strength and eliminates discomfort in circulation, discomfort due to bumps or exfoliation.

The CARGOSFALT product is used as a material for waterproofing asphalt and stopping the degradation state as well as partial regeneration of bitumen from the existing structure.

The types of degradation that can be remedied by applying these products are as follows:

a) in the case of asphalt roads:

- porous, sliding or aged surface;
- cracks and voids;
- cracks.

b) cement concrete surfaces:

- porous or alveolous surface;
- exfoliation, cracks;
- joints decolmations.

It is also very important to apply CARGOSFALT concentrate or CARGOSFALT T (TREATMENT) as priming for thin asphalt roads (4-5 cm), because it treats in aprofusime and regenerates the support surface (strength layer). [4]

For roads with increased circulation and increased traffic speeds, it is recommended to cover with the CARGOSFALT product or it can replace the wear layer by applying on the binder. ROMIS TL 2004 S.R.L with the participation of INCERTRANS S.A. carried out field studies with the product

CARGOSFALT T (treatment) and CARGOSFALT B (basalt) on the road DN 73 that connects the Brașov Municipality with the Pitesti Municipality - Dîmbovicioara area.

Road traffic, climatic factors, quality of road materials and quality of the foundation ground are factors that influence the operation of road systems.

The case study contains theoretical studies and experimental research on the behavior in operation on the DN73 road sector, on an area of 250 m^2.

Measurements were made to determine the roughness of the product CARGOSFALT T (treatment) and CARGOSFALT B (basalt). [5]

The CARGOSFALT product reponds qualitatively to the requirements, thus it attests a high chemical and mechanical stability due to the following characteristics:

- water impermeability , acids, alkaline substances, salts;
- resistance to permanent deformations at high temperatures;
- resistance to cracking at low temperatures (- 30^0C).

The applied product adheres to the road surface by penetrating into the depth of the mass creating a chemical bond and thus the bitumen regains its plastic and elastic properties.

The application of CARGOSFALT B (basalt) product to the execution of road maintenance and repair works ensures viability in operation, in safe and comfortable conditions, for the areas specified above.

After applying the product to the road surface, a thin membrane with a continuous and uniform appearance is obtained, which increases the road grip of the tires. This reduces the braking distance and increases traffic safety. Also, the product does not cause any damage to the road.

For covering cracks, CARGOSFALT T (treatment) is used with the addition of micronized aggregates, a material that can be spread, used after pre-preparation of the surface (dusting). The product can be used in relatively wide cracks as it solidifies very quickly and remains flexible (it adheres to the walls of crack).

Fig. 1 Preparation of areas;

Fig. 2 Cutting asphalt to get a joint

In the case of cold fillings, prepare the filling area by cutting the asphalt to obtain a vertical joint, apply excess cold asphalt (fill with 25% more than the volume of the pit) and compact the surface with a compactor cylinder lis-lis . When the pits are deeper than 4 cm (eg: 8 ÷ 10 cm), compaction is done in successive layers of 4 cm thick.

For in-situ use on RAP miling or basalt aggregates or similar, (dust up to 100 kg/m2, depending on granulometry) apply with an asphalt applicator or paver (grinder), or level, compact, then spray CARGOSFALT concentrate. For this application it takes at least of 10˚C ground temperature and milled RAP or basalt aggregates or similar to be dried.

Fig. 3 & 4 Applying the product with an asphalt applicator or paver (grader).

Another cold-applied material, CARGOSFALT B (basalt) is also used as a waterproofing material for the asphalt surface, it "seals" and stops the degradation state, sealing the microcracks, regenerating of bituminous clothting.

CARGOSFALT B (basalt) allows to increase the coefficient of adhesion of tires and reduce the braking distance in traffic. Prevents the penetration of water, gases or different chemical components, salts. Reducing the degree of atmospheric pollution due to the application of the material at ambient temperature. [6]

Fig. 5 & 6 Application of CRAGOSFALT B product (basalt) on DN 73

Table 1. Results obtained from determination of roughness –tests "in situ" DN 73 at 3 and 7 days after bedding

Position	No. days	SRT determined characteristics (SRT units)						Imposed limits SRT (SRT units)
		1	2	3	4	5	Average	
Untreated	3	56	56	56	56	58	**56.5**	Min. 60
	7	56	56	56	56	58	**56.5**	
1	3	85	70	79	82	79	**79.0**	
	7	92	85	82	82	88	**85.8**	
2	3	76	64	72	72	72	**71.2**	
	7	80	84	80	81	81	**81.2**	
3	3	74	78	72	74	70	**73.6**	
	7	78	78	70	74	74	**74.8**	
4	3	66	72	74	72	67	**70.2**	
	7	75	72	71	71	71	**72.0**	
5	3	72	72	70	70	66	**70.0**	
	7	78	78	76	76	74	**76.4**	
6	3	78	77	73	78	78	**76.8**	
	7	76	76	70	74	78	**74.8**	

Fig. 7 DN 73 road arias treated with CRAGOSFALT B product (basalt)

Fig. 8 Determination of roughness with the SRT pendulum

Table 2. Results obtained from determination of roughness –tests "in situ" DN 73 7 days after after bedding the product CARGOSFALT B (basalt)

Position	SRT determined characteristics (SRT units)						Imposed limits SRT (SRT units)
	1	2	3	4	5	Average	
Untreated	56	56	56	56	58	**56.5**	**Min. 60**
1	76	72	60	74	73	**71.0**	
2	81	70	75	80	82	**77.6**	
3	94	94	91	92	90	**92.2**	
4	96	100	96	99	100	**98.2**	

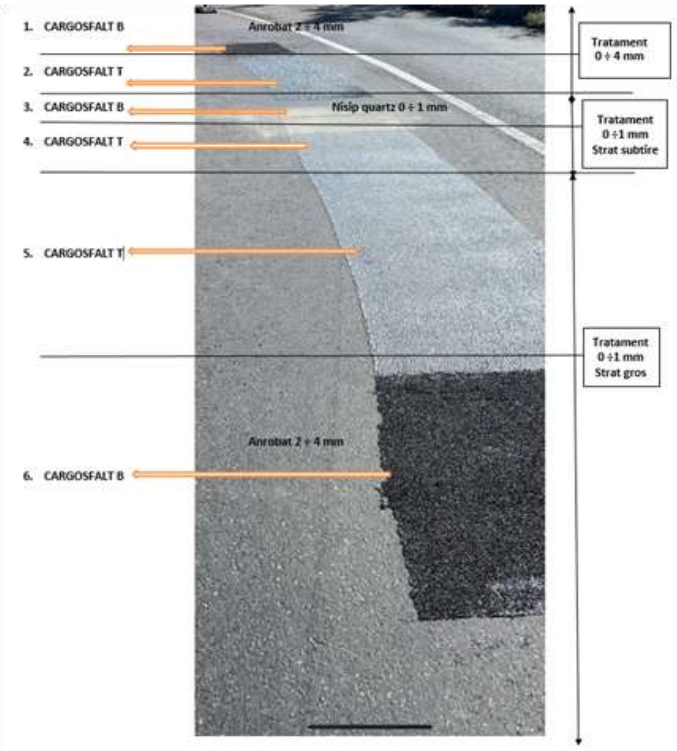

Fig. 9 Waterproof coatings with CARGOSFALT (DN 73) treatment performed 3 days after bedding

3. Conclusions

It is observed that the asphalt surface on the studied road sector treated with the CARGOSFALT product shows higher roughness values than on the road sector not treated with CARGOSFALT.

The results demonstrate that the CARGOSFALT product has improved the properties of the asphalt mixture on which it was applied and provides regeneration of the bituminous clothing and stopping the occurrence of asphalt surface degradation.

The product CARGOSFALT T (treatment) is used as a waterproofing material for asphalt and stopping the degradation state, regenerating bituminous clothing.

After applying the product to the road surface, a thin membrane with a continuous and uniform appearance is obtained, which increases the adhesion of the tires to the road. This reduces the braking distance. The applied product prevents the penetration of water, gases, salts or various chemical components.
The economic advantages of the technology are that, by using CARGOSFALT, the consistency and service life of existing asphalt coatings is increased, since the

material itself closes the microcracks well, preventing water from entering the treated surface. It is more economical to treat the surface, than to apply a new layer of asphalt. Based on the above, the lifetime of asphalt clothing can be extended. From an environmental point of view, the advantage of the technology lies in the time lag of the planned repair, thus reducing the impact of each repair on the environment.

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