BEST: International Journal of Management, Information Technology and Engineering (BEST: IJMITE)
ISSN 2348-0513
Vol. 2, Issue 3, Mar 2014, 131-134

INNOVATIVE TECHNOLOGY IN THE FIELD OF AUTOMOBILE COMPLEX WASTES TREATMENT

V. DEMYANOVA[1], O. GRINTSOVA[2], A. GUSEV[3], & G. KARPUHIN[4]

[1]Professor, HOD, FSBEE HPE "Penza State University of Architecture and Constructions", "Engineering Ecology", Penza, Russia

[2]FSBEE HPE, "Penza State University of Architecture and Constructions", Dozent, Penza, Russia

[3]Senior Lecturer, FSBEE HPE "Penza State University of Architecture and Constructions" Penza, Russia

[4]Student, FSBEE HPE "Penza State University of Architecture and Constructions", Penza, Russia

ABSTRACT

The results of waste tyres procession products use as a secondary resource at production of local rubber tile and disperse reinforce concrete are given.

KEYWORDS: Waste Tyres, Products of Recycling, Rubber Crump, Steel Cord, Technology

INTRODUCTION

In the period of implementation the concept of "industrial metabolism" based on wastes use in production the problem of natural and artificial wastes recycling gets special urgency. [1, 2]

Now the growth of motorization, intensive development of motor complex are accompanied by a number of unfavorable factors disturbing ecological balance. Throughout the world there is a continuous process of waste tyres accumulation, every year their volume is increased by 10-15 mln. tons and only 20% of them is processed. There are some reasons which prevent rapid development the process of waste tyres recycling products use: different composition and properties of this secondary raw material; deficiency of industrial processes for waste tyre recycle and plants. [3] However the interest to recycling of waste tyres processed products has increased, different ways of processing waste tyres are researched. The most economically and environmentally efficient method is a method of mechanical recycling of waste tyres [4, 5]. Its advantage is the ability of getting recycled products which possess the same quality indicators as the material used for tyre production.

The disadvantages are fire hazard, considerable amount of dust, the necessity to adjust the equipment, etc. Separating the tyre components for rubber crump, steel cord and fabric makes possible to use them in every region of the Russian Federation. Over 60% of processed products are accounted for rubber powder. Speaking about modern innovative technologies for tyres recycling we should mention the organization of innovative enterprise "Ekoresurs" at the Department of Engineering Ecology of PGUAS, its main activity is development of a modern high-tech complex with equipment for waste-free processing of used tyres and producing high-quality products based on rubber crumb. A market of highly innovative and high-quality flooring and roofing materials with the use of rubber crump as the main component has been formed on the bases of "Ekoresurs" [6]. Local rubber tile is a composite material consisting of two layers. The main layer is pressed rubber crumb.

Polyurethane adhesive of foreign TOP-UR-E-PVC, TOP-UR- 40 and domestic producers (TU 2252-021-13238275-01) is offered as a crumb binder. The possibility of using plastic processing products as a binder

is researched. The resulting rubber tile is a flexible and elastic material which is cut into desired size, easy to install and has a high vibration and noise insulation and water resistance.

To make an unusual form of the roof and increase the strength of adhesion with the rubber layer on the upper tile base it is possible to make granular coating (crushed rock wastes), which increases resistance to ultraviolet radiation.

Table 1: Physical and Mechanical Properties of Tile Roofing

№	Name of Indicators	Unit	Indicators
1	Density not less than	kt/m^3	1190
2	Tensile strength not less than	MPa	3,6
3	Water absorption, no more than	%	1,2
4	Waterproof for 72 hours, at least	MPa	0,3
5	Elasticity at temperature 20 °C	–	No cracks or fractures
6	Heat resistance, not less than	°C	80
7	Frost resistance, not less than	cycles	250

The use of steel cord fiber is of practical and scientific interest. A comparative analysis of steel cord and industrial fiber used for production of disperse reinforced fibro concrete has been fulfilled. (Table 2).

Table 2: Comparative Characteristics of Steel Fiber

№	Name	Length, Mm	Diameter, Mm	Прочность, Mpa	Стоимость, Rub./T.
1	Steel cord cleared	15…50	0,2…1,0	210…280	5000…10000
2	Metal fiber (industrial)	10…50	0,1…1,0	110…300	30000….72000

As follows from Table 2, fiber, obtained from worn tires processing, slightly differ in physical and mechanical properties from industrial fiber, while its cost is significantly lower. Fiber obtained from steel cord has different degree of clearing. For important structures only high-strength fiber-reinforced concrete is required and, therefore, high-quality components for its making are necessary. The use of steel cord with rubber inclusions (rubber no more than 1... 4%) is possible only for fiber concrete of medium grades. In this paper we propose the following kinds of dispersed reinforced concretes:

- Stone concrete class B80 - B100 according to strength, also for "pavements";
- Medium grade fine-grained concretes for "floating floor" of civil and industrial buildings;
- Reactive powder concretes of new class generation B100 and higher according to strength.

Technology for producing of dispersed reinforced concretes with strength over 100 MPa involves the use of complex organic modifiers (COM). The main mineral component of complex organic modifiers is natural stone materials mining wastes and fine sands deposits of the Penza region, containing quartz. As an organic component they have powder super- and hypersuper-plasticizers. [6]. The influence of COM and steel fiber from steel wire cord on psycho- mechanical and performance properties of steel fibro-concrete is revealed.

An increase of tensile strength at bending, resistance to dynamic loads, maintaining concrete integrity in extreme operating conditions are revealed. [6] For making "floating floor" for industrial and civil buildings dispersed reinforced fine-grained concrete of medium brands are used. Initially, soundproofing material is put on the slab than cement covering 60mm thick is layed. Contact of cement covering with the wall and floor slab is fulfilled directly by the noise-proof fabric and it reduces the frequency of noise impact by 11 .. 19 dB. To improve crack resistance cement covering is reinforced by

a net 50x50mm, the wire diameter - 3 ... 5mm. The cost of one square meter net is 90 ... 250 rub. Making covering from fiber concrete makes possible to accelerate the work, reduce labor costs, reduce structural weight and its cost. The efficiency of dispersed steel fibers use, including fibers from wastes instead of steel industrial valves is increased with the transition to high-strength fine-grained powder concretes of new generation. In concretes of new generations uniform distribution of fiber over the cross section is completely realized. The proposed solutions can solve the environmental problem of recycling industrial and transport wastes, to expand the resource base of building materials by using secondary resources, thus making contribution to a significant reduction of specially manufactured industrial materials, to reduce human impacts on the environment, reduce the influence of the environmental component on environment pollution and the degree of population diseases.

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AUTHOR’S DETAILS

Demyanova Valentina, FSBEE HPE “Penza state university of architecture and constructions”, Dc. of Sc., prof, head of the department “Engineering ecology”, Home address: Penza, Pushkina street 73-74, Work address: 440028, Penza, G. Titova street 28, PGUAS,

Grintsova Olga, FSBEE HPE “Penza state university of architecture and constructions”, Cand. of Sc., dozent, Home address: Penza, Karpinskogo street 24-78, Work address: 440028, Penza, G. Titova street 28, PGUAS

Gusev Alexey, FSBEE HPE “Penza state university of architecture and constructions”, Senior lecturer, Home address: Penza, Lenina street 15, Work address: 440028, Penza, G. Titova street 28, PGUAS

Karpuhin Genady, FSBEE HPE “Penza state university of architecture and constructions”, Student Home address: Penza, Bolshaya Arbekovskaya street 101, Work address: 440028, Penza, G. Titova street 28, PGUAS