

POSSIBILITIES FOR THE CONSERVATION OF TIMBER, USED IN RESIDENTIAL AND PUBLIC BUILDINGS

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ABSTRACT

The results for the defining of the quantity of the intake substance (intake – P), swelling - shrinkage – the volume anti-swelling effect – ASE_v, coefficient of effectivity – Kase_v of the treated with conservative means beech timber (*Fagus silvatica* L.) and Macedonia pine (*Pinus peuce* Gris.) have been given. The processing of the sample bodies has been carried out in concordance with requirements of the active standards. As conservative means are used impregnator and finish – impregnator, offered by the Italian firm „Atria“.

The results from the research could be used as recommendations in the furniture production, wood assembled houses and constructions in the special productions, as well as from laboratories for testing timber and timber materials, and for preventive control of the quality of the produced timber products.

Key words: Intake, Swelling, Shrinkage, Volume anti-swelling effect, Coefficient of effectivity, Conservative means, Beech timber (*Fagus silvatica* L.) and Macedonia pine (*Pinus peuce* Gris.)

INTRODUCTION

The improvement of the hydrophobic properties of timber is of basic significance for the increase of its exploitation durability and the possibilities for its implementation in residential and public buildings. Researches in this respect have been carried out in our country with local tree species [1, 2, 3, 4 and 5]. The constantly changing nomenclature in the conservation means offered in our country makes it necessary to continue the research in this direction. With a view to that experimental research with beech timber (*Fagus silvatica* L.) and Macedonian pine for the defining of the anti - swelling effect and the coefficient of effectiveness in its conservation processing with protective means Italian production have been carried out. The volume anti – swelling effect – ASE_v and the effectiveness coefficient – Kase_v are important criteria in the defining of the opportunities for timber conservation, implemented in the building of different objects. The beech timber has been

chosen for the experiments, because in Bulgaria it is with industrial significance and this of the Macedonian pine (*Pinus peuce* Gris.) – as valuable, widely used in our country in historical, cultural, religious or artistic significance. After the research carried out concerning the offered on the Bulgarian market conservative (protective) means for the carrying out of the experiments have been chosen not very well or not much researched such in our country, offered by famous European and World manufacturers and trade companies. The conservative timber products offered by the Italian company „Atria“ are of interest. For the research on the project Atriawood impregnate – impregnator for basic timber processing and Atriawood cerato – product from the modern finishes generation – impregnators containing additives from natural bee clay have been used.

METHODS

In the selection and preparation of the sample bodies for experimentation are taken

into consideration the common requirements towards the physical – mechanical tests and the statistical analysis of the results according to the Standard of BDS 17204 – 90. The processing of the sample bodies has been carried out in concordance with the requirements of the Standards applicable now (ST of SIV 6010-87; ST of SIV 6089 – 87). The results have been processed variation-al – statistical. The research carried out has been financed by the University of Forestry – Sofia in accordance with the contract № 33 from 13.04.2009 г.

The density of timber of two tree species in absolute dry condition has been defined after which it has been recalculated for 12% water contents. The points for the radial, tangent and volume swelling and shrinkage of untreated with conservation means timber of two tree species have been defined. The mean points of the results are presented in table 1.

Laboratory experiments have been carried out for the definition of the quantity of the absorbed substance (the absorption – P), swelling - α , shrinkage - β , the volume anti – swelling effect – ASE_v and the effectivity coefficient – Kase_v of the treated with the mentioned conservative means beech timber (*Fagus silvatica* L.) and Macedonian pine (*Pinus peuce* Gris.). The mean points of the results are presented in table 2 and 3.

The quantity of the substance absorbed by timber has been defined in percents according to formula 1:

$$P = \frac{m_{01} - m_0}{m_0} \cdot 100 \% \quad (1)$$

where m_{01} and m_0 are accordingly the masses of the sample bodies in absolutely dry condition before and after treatment.

The anti – swelling effect has been defined in percents according to formula 2:

$$ASE = \frac{\alpha_k - \alpha_t}{\alpha_k} \cdot 100 \% \quad (2)$$

where α_k and α_t are accordingly the swelling of the unprocessed and treated with conservation means sample bodies.

The effectivity coefficient is defined according to formula 3:

$$Kase = \frac{ASE}{P} \quad (3)$$

RESULTS AND DISCUSSION

The results from the carried out experiments (tables 1, 2 and 3) grant the opportunity to make some basic conclusions and recommendations. The researched conservation means give well results in both tree species, whereas in the conifer species they are with higher points. The volume anti – swelling effect in the Macedonian pine is in the variation from 17 to 22 % and in the beech – from 7 to 12 %. These are comparatively high points, considering the fact they are received in a little quantity of absorbed substance, e. g. in a high effectivity coefficient. The bigger effect in the Macedonian pine is due to fact that although without protective processing, the points of swelling and shrinkage in this timber are comparatively low, e.g. it is with very good dimensional stability in its natural type.

The decrease of the points of swelling and shrinkage of the treated with conservative means timber suggests diminished hygroscopicity, limited dynamics of the water and moisture absorption, better stability of the measures and form of the details in such a timber in changing parameters of the environment. The researched conservatives have a defined hydrophobic effect and it could be improved additionally, with combined processing with impregnator (as a base processing) and finish – impregnator (as a finish processing).

Table 3: Statistical values of the results for intake, swelling, shrinkage, anti - swelling effect and coefficient of effectivity of treated with conservatives timber of Macedonian pine.

Statistical values	Treated with conservatives timber								
	Intake	Swelling			Shrinkage			Anti-swelling effect	Coefficient of effectivity
	P, [%]	α_r , [%]	α_t , [%]	α_v , [%]	β_r , [%]	β_t , [%]	β_v , [%]	ASEv, [%]	Kasev
Macedonian pine - impregnator									
1. Mean value, \bar{x}	0,72	2,50	6,80	9,47	2,44	6,36	8,65	17,18	24,10
2. Maximal value, x_{max}	0,93	2,97	8,91	11,43	2,88	8,18	10,26	20,42	34,17
3. Minimal value, x_{min}	0,60	1,89	5,63	8,24	1,85	5,33	7,61	14,19	16,46
4. Standard deviation, s	0,11	0,28	0,73	0,74	0,26	0,63	0,62	2,09	4,02
5. Coeff. of variacion, v	14,67	11,0	10,72	7,84	10,76	9,95	7,12	12,17	16,70
6. Average error, s_r	0,03	0,07	0,19	0,19	0,07	0,16	0,16	0,54	1,04
7. Index of correctness, p	3,79	2,84	2,77	2,02	2,78	2,57	1,84	3,14	4,31
8. Number of sample bodies, n	15	15	15	15	15	15	15	15	15
Macedonian pine – Finish - impregnator									
1. Mean value, \bar{x}	2,63	2,67	6,43	9,28	2,60	6,03	8,48	22,11	8,48
2. Maximal value, x_{max}	2,97	3,45	9,64	12,17	3,33	8,80	10,85	26,37	10,81
3. Minimal value, x_{min}	2,31	1,87	5,37	7,34	1,83	5,09	6,83	18,67	6,92
4. Standard deviation, s	0,24	0,49	1,24	1,30	0,46	1,07	1,08	2,28	1,28
5. Coeff. of variacion, v	9,00	18,2	19,20	14,01	17,79	17,79	12,75	10,32	15,05
6. Average error, s_r	0,06	0,13	0,32	0,34	0,12	0,28	0,28	0,59	0,33
7. Index of correctness, p	2,32	4,71	4,96	3,62	4,59	4,59	3,29	2,66	3,89
8. Number of sample bodies, n	15	15	15	15	15	15	15	15	15

CONCLUSION

The researched in the present study products of the Italian firm “Atria” ensure good protection of timber according to unfavorable factors, acting on it and increase its exploitation durability. They are technological, with good ratio price – quality, comparatively ecological in the work and the ensuing exploitation. All this gives reason to recommend their usage in the furniture production, floor coverings, assembled houses and timber constructions, in the special productions together with the products of other present on the Bulgarian market companies.

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