Increasing the service-life of timber by means of wood preservative, fire-retardants and hydrophobizators

Modern methods of increasing the timber durability of wood depend on its special purpose and environmental conditions. Timber belongs to the group of inflammable biologically destructive materials. Therefore fireproof materials such as fire-retardants, fire-proof paints, paste, plasters, etc. on the one hand and preservative, fungicidal admixes for protection against corrosion on the other hand are necessary in order to increase building and structure durability.

In order to protect wooden constructions it is necessary to:

- to impregnate wood with fire-retardant;
- to paint the surface with fire-proof paint;
- to coat it with fire-proof paste;
- to cover surface with fireproof plaster > 2cm.

The list of antimatters has been dramatically reduced as a result of increased demands of European standards for defense compositions. They should have following properties:

- to prevent burning;
- not to provoke corrosion of metal parts;
- not to exceed hygroscopic properties of wood
- not to be toxic for people and animals
- not to affect paint coat applied on the surface
- to provide bio-proofness with wood preservatives
- not to create obstacles during mechanical conversion
- to have long-term effect
- not to affect **the** wood properties
- to be economical

On the other hand the wood consisting mostly from cellulose is a nutritional substance for many microorganisms and macroorganisms that cause biocorrosion.

Main cause of cellulose decay are fungi such as **Aspergillus, Fusarium, Chaetomium, Rhizoctonia solani, Botrytis cinerea** and others. The large group of wood-destroying fungi - **Serpula lacrymaus, Phaeolus schweinitzii, Poria vallantii** and others participate in decay of cellulose incrusted with lignin (wood) thus causing brown rot that is specified by dark color, mouldering and ability to turn wood into dust. There are some lignin-destroying fungi that decompose wood components simultaneously or cellulose components first and lignin next **(Armillariella mallea, Phellinus pini, Inonotus dryophilus, etc.)**.

The result is a so-called corrosion rot that is fibrous and soft in the cell walls. Various fungi classes have different decomposition intensity. Wood-destroying fungi have the greatest rate of growth at 30-80% absolute humidity of wood. The degree of wood humidity can serve as a factor limiting the growth and destructive activities of a number of fungi.

It is also significant that with some fungi, especially moulds, even a small decrease in humidity retards the formation of spores.

It is also important to protect wood against attack of technical pests-borer - insect larvae**,** such as house-grinder - **Anobium sp;** barbel house - **Hylotrupes Bajulus;** barbel - **Ergates Faber;** large horntails - **Sirex sp; luctus sp,** etc. This complex problem of improving the durability of timber stimulated development of effective flame retardants that meet the above mentioned requirements and have effective antiseptic fungicide properties.

Therefore to provide the combined protection of wooden structures from fire, rot and pests, technical formulations of flame retardants with antiseptic additives that do not reduce fire-retardant properties have been developed.

At present a number of flame retardants and antiseptics are known that can reliably protect the wood from the fire and biodegradation. However, due to the fact that wood is impregnated with solutions of the substance that must be highly soluble in water, these solutions are also highly soluble under the influence of atmospheric

precipitation. As a result, flame retardants and antiseptics are washed out of the wood and the wood loses its fire- and bioprotective properties.

To prevent washing out of retardants and antiseptics a series of water repellents "Gidroeffekt" has been developed, the admix allows to prevent the ingress of water into the wood pores and leaching agents.

There are water repellents produced either on an organic solvent or in the form of fine water-based emulsion. So in one case treating wood impregnated with fire-retardants and wood preservatives preserves the texture, does not prevent the breath, but does not pass the drip water, in the other case - the surface is covered with a thin hydrophobic film, resulting in a fully closed pores.

In both cases, waterproofing of the wood surface protects fire retardant and preservative from "salting out" during fluctuations of moisture in the ambient space and rainwater flows.

Hydrophobic coatings "Gidroeffekt" are non-flammable, non-toxic, contain no heavy metals, and chlorine, can stand irradiation of ultraviolet sun.

The surface treatment of wood by means of water repellents "Gidroeffekt" can also be carried out without prior impregnation with fire-retardants and antiseptics. It will significantly increase the service life of the wood due to the lack of moisture that causes development of micro- and macro-organisms. **Organic solvents admixes** are recommended for outdoor wood treatment, while water-based admixes are meant for indoor use.

Staining of repellents in different colors based on pH of the solution makes it possible to finish the decorative It opens the possibility of a decorative wood finishing to obtain a color palette of different colored wood.

Thus, depending on the purpose and the appropriate level of protection, wood processing includes various technologies:

1. Usual wood treatment with appropriate water repellents "Gidroeffekt." -
2. Impregnation of wood with fire retardant and then hydrophobizator.
3. Impregnation of wood with preservative, fire retardant, and then treatment with hydrophobizator.

4. Wood treatment with one agent having a fire retardant and fungicidal properties, and then treating it with hydrophobizator. High quality and wood longevity will depend on the compliance with regulations and conditions of phased woodworking.