

Abstracts of Main Papers

Cutting Force of a Single Saw Tooth I.

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MOKUZAI GAKKAISHI 27 (4), pp. 290~295 (1981)

In this study, orthogonal cutting by a single swage-set tooth was performed on air dried makamba, a Japanese birch (*Betula maximowicziana* Reg.). The effects of the grain angle, the width of tooth kerf, the depth of cut, and the width of the cutting on the cutting force were investigated.

The results obtained were as follows:

(1) The parallel and normal component-forces varied with the grain angle. The parallel force increased with the grain angle against the grain from 0° to 90° and decreased as the grain angle increased with the grain from 90° to 180° and from 270° to 360° . The absolute value of normal force was the greatest at grain angles of 45° , 135° , 225° , and 315° , the minimum was at grain angles of 90° and 180° .

(2) On cutting end grain, the parallel and normal forces decreased as the rake angle increased. The parallel force, when the depth of the cut became larger, showed higher values.

(3) The parallel and normal forces increased directly with the width of tooth kerf.

(4) The parallel and normal forces were in proportion to the width of cutting. However, when the width of the cutting was wider than 4.2mm, the forces were invariable.

(5) The lateral force was small and acted as it pushed away the workpiece.

Cutting Force of a Single Saw Tooth II.

Reiichi AMEMIYA and Tsuneo AOYAMA

MOKUZAI GAKKAISHI 28 (1), pp. 31~38 (1982)

In order to investigate the effects of the top bevel-angle, the face bevel-angle, the depth of cut, and width of the cutting on the cutting force, an orthogonal cutting by a single spring-set tooth was made on air-dried makamba (*Betula maximowicziana* Reg.).

1) As results of the Series I cutting, with end grain cutting, the parallel force increased exponentially with the depth of the cut, and linearly with the front projection of the cutting area. The parallel force, when the top bevel-angle increased, had higher values the effects of the depth of cut, the top bevel-angle, and the face bevel-angle on the normal of rce were similar to the effects on the parallel force. The lateral force increased exponentially with the increased depth of the cut in the range of 5° to 20° for the face bevel-angle, and was influenced by both the top bevel-angle and the face bevel-angle. The lateral force increased linearly with the side projection of the cutting area. In cross cutting, each component of the

cutting force was smaller than that while cutting end grain, although each component showed a similar tendency.

2) As a result of the Series II cutting, the parallel, normal, and lateral forces increased linearly with increases in the depth of the cut and the width of the cutting.

Studies on a Construction Material Using a Rotary-Peeled Veneer —a Rolled Veneer Column (RVC) I— Patterns of the gluing pressure system in the RVC processing machine

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Aiming at the development of a wood-based construction material, a rolled-veneer column (RVC) was designed by laminating a rotary-peeled veneer continuously and cylindrically.

In the first study of a series, the gluing pressure system of the RVC production process was investigated. During the production of RVC, veneers were pressed intermittently and cyclically at room temperature. Patterns of the gluing pressure system were classified into three types. Compared with plywood and laminated lumber production, the gluing pressure in this process was very low. Therefore, the selection of an adequate adhesive should be the key to success for this production system.

In the consideration of RVC as a laminar material, the transmission of gluing pressure into the RVC and its distribution also are discussed by means of the finite-element method with respect to non-linear field problems.

A Computer Simulation of Grain Patterns on Sawn Surfaces

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When soft x-rays were radiated onto the log, irregularities and distribution of annual rings and knots on the cross-diameter perpendicular to the soft x-ray radiation were reproduced on a radiograph. Annual rings resulted in lateral stripes, and knots appeared as dark shadows.

After the numerical conversion of figures and the distribution of annual rings and knots in the entire stem-length, coordinates for where a hypothetical sawing plane would cross each of the annual rings and knots was simulated by means of a microcomputer. Grain patterns of the surfaces hypothetically sawn also were graphically displayed on a monitor screen.

Results of the simulation were acceptable. With this system, sawyers can turn heavy log easily, inspect them on the monitor screen, and predict the grain pattern which will appear on any hypothetical sawing surface before they commence sawing.

Termiticidal Activities of Synthetic Pyrethroids

Yoshiyuki INOUE

Pesticide Chemistry: Human Welfare and the Environment, **1**, pp. 113~118 (1983)

It is necessary in wood preservation to test new products due to recent restrictions of ecological nature to which most insecticides are been submitted. Pyrethroids are becoming increasingly important as termite control agents because they possess exceptional insecticidal activity, low mammalian toxicity and environmental safety. The efficiency of several pyrethroids was evaluated compared to chlordane and other insecticides. Based on results obtained, it can be concluded that permethrin was the most efficient termiticide; the performance of permethrin was better than that of chlordane. The laboratory results show that pyrethroids could replace organo-chlorinated insecticides on the control of termites and powder post beetles. Field test should be carried out in order to confirm the laboratory tests for actual use of permethrin.

The Moisture Content of Wood under the Floors of Shrines and Temples in Relation to Microbial Deterioration of Wood

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Assoc. Scientific Research on Historic and Antistic works of Japan, **29**, pp. 1~8 (1984)

Wood-inhabiting fungi may be classified into three groups according to the nature of development in and on wood: the wood-rotting fungi, wood staining fungi, and molds. Some kinds of woods are susceptible to attack by a number of fungi and it is not uncommon to observe two sorts or even more of fungi developing on a single wood, while moisture required by individual fungi is very variable.

This study aims at investigating moisture content of wood and identifying the genus of molds concerned under various conditions. The cases studied are as follows: the Eirin-ji temple (ca. 150 years old, Niigata prefecture), Ichinoya shrine (Tsukuba academic town, Ibaragi prefecture), Ichinoya yasaka shrine (ibid.), and Suwa shrine (ibid.). The investigation of the Eirin-ji temple started in the beginning of December 1982. The species of wood used for the floor post and foundation were mainly *Chamaecyparis obtusa* Endl. and partially *Zelkova serrata* Makino. Moisture condensation was observed on the surface of the foundation. The study of fungi from the three shrine was carried out all through the year of 1982. Sixteen genera of molds were identified after isolating fungi collected from the surface of wood by Scotch tape method.

In general, the moisture content of floor posts varies with a function of the distance from the surface of the foundation stone. The lowest moisture was observed at 50 cm apart from the bottom of the floor post. The highest moisture content was about 40% for both the floor post and the foundation.

It was observed that a moisture content which exceeds considerably the fiber saturation point of wood enhances the development of wood-rotting fungi. The growth of fungi is retarded in wood of 25 to 30% moisture content and completely inhibited below 20%. Dew formation on the surface of the foundation stone raises the moisture content of wood. In the case of floor posts, the development of mold growth may be intermittent because of their alternate wetting and drying.

Surface Electrochemical Studies of Wood Treated with Wood Preservatives (I) Streaming Potential of Wood.

Yeongsuk KIM · Ken-ichi KURODA and Yoshiyuki INOUE

J. Antibacterial and Antifungal Agent, **13**, pp. 389~394 (1985)

In wood, the reactions of the penetration and fixation of chemicals proceed on the interface with chemicals and the field adjacent to wood. This investigation is undertaken to consider the application of the method of streaming potential to the scope of wood preservation. It is conceivable that streaming potential of wood is considerably related to fixation of water-borne wood preservatives. The purpose of this paper is aiming at streaming potential of wood, the wood-water interactions, the correlation of wood species, wood flour sizes, hydration and so forth in ζ -potential. We measured streaming potential of various woods, including *Cryptomeria japonica*, *Abies sachalinensis*, *Pinus densiflora*, *Populus Maximowiczii*, *Fagus crenata* using the apparatus for streaming potential measurement (Shimadzu ZP 10 B type) and ζ -potential is calculated by equation of Helmholtz-Smoluchowski.

The results obtained were as follows;

1. ζ -potential of wood showed the negative value and varied with wood species, indicating $-6.6 \sim -6.9$ mV in hardwood and $-5.7 \sim -6.1$ mV in softwood.

2. ζ -potential of wood flour decreased in negative value as the wood flour size is smaller, and wood flour with the smaller size showed a stable values while that of larger size showed unstable values in the measurement.

3. It would be considered that when wood flour was immersed in water for a long time, the ζ -potential of wood flour became to increase, as the distance from the wood surface to the slipping plane became to increase after the formation of electrical double layer.

4. It was shown that the extractives affects on ζ -potential of wood flour. The values of ζ -potential became to stable by extracting with alcohol-benzene, and the wood contains more extractives showed larger negative charge comparing to that of small amount of extractives.

Surface Electrochemical Studies of Wood Treated with Wood Preservatives (II) Fixation and ζ -Potential of Copper-Chromium-Arsenic Wood Preservatives.

Yeongsuk KIM · Ken-ichi KURODA and Yoshiyuki INOUE

J. Antibacterial and Antifungal Agent, **13**, pp. 445-451 (1985)

In the case of the water-borne wood preservatives, the reactivity for wood, the adsorption at total surface of wood, and the penetrability of wood cell membrane are of great importance. All these properties may be mainly considered as the results of the ionization of the treating solution and of the reactions based on the electrokinetic phenomena. In this paper, the fixation of wood preservatives was investigated using the method of surface electrochemistry. Especially, the relation between the ζ -potential of wood treated with Cu-Cr-As type wood preservatives and the fixation phenomena was studied. We attempted to measure the streaming potential for the wood treated with a different type of Cu-Cr-As type wood preservatives.

Results obtained were as follows;

1. The wood treated with Cu-Cr-As type wood preservatives showed lower value in ζ -potential than that of untreated wood.
2. It was shown that there were remarkable changes of ζ -potential of wood treated with various type of Cu-Cr-As wood preservatives in the early stage of fixation. When the woods treated with CCA 2-type (A. W. P. A., CCA-B type) were seasoned more than 10 days after impregnation, those showed considerably constant value in ζ -potential. This shows that the constituents of preservative were fixed in wood almost completely. On the other hand, the stable ζ -potential values of CCA 1-type (B. S, 4072, CCA-1 type) and 3-type (A. W. P. A., CCA-C type) were not obtained on 30 days after impregnation.
3. With an increase of the concentration of treating solution, ζ -potential of the treated wood decreased.
4. Amount of copper leached from the treated wood differed in the type of Cu-Cr-As type wood preservatives and their fixation periods to wood. In the case of CCA 1-type and 3-type, the amounts of leached copper are more than that of CCA 2-type.
5. When streaming potential was measured, the electric conductivity of water which was passed through the sample layer showed slightly high value in the early stage of fixation. And the conductivity increased with an increase of the concentration of treating solution. It was shown that those value was higher both in CCA 1-type and 3-type than in CCA 2-type.