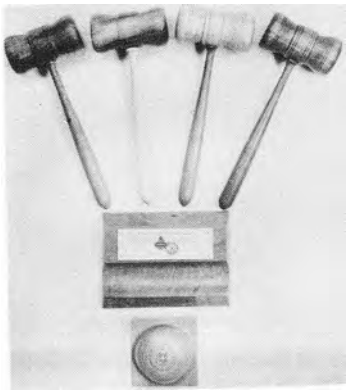
FOREST PRODUCTS LABORATORY (Madison 5, Wis,)
FOREST SERVICE, U. S. DEPARTMENT OF AGRICULTURE
Approved Technical Article

Seasoning Green-Wood Carvings With Polyethylene Glycol-1000[1]

A NUMBER OF CRAFT INDUSTRIES and a host of wood hobbyists are either using or experimenting with polyethylene glycol-1000 to season green-wood turnings and carvings. In this application, the idea is simply to get enough of the chemical into the green wood to prevent the splitting and checking that so frequently develop in green carvings or thick blocks of untreated wood dried by conventional methods. Little or no data have been published on the minimum treatment needed to achieve this limited objective, so guidelines for such chemical seasoning have been largely lacking.

In the experiments here reported, one dozen each of several standard green-wood carvings produced by the Crane Creek Company (see illustrations) were soaked in a 30 percent (by weight) solution of polyethylene glycol-1000 for various times and at different temperatures. Treating was done in plywood-lined soaking vats that were electrically heated and thermostatically controlled. The solution in the vats was circulated periodically to maintain uniform temperature conditions. Immediately following the soaking, samples were cut off two carvings from each treatment, and analyses were made to determine the amount of polyethylene glycol in the outer 1/8 inch. All carvings were shaped on a duplicating lathe from blocks cut from a single, fresh-sawn walnut flitch.



PAPERWEIGHT, PENCIL HOLDER, AND GAVELS made at the Forest Products Laboratory from wild-grain hard-to-season woods that were chemically treated and then dried to flawless perfection.

GREEN-WOOD CARVINGS the size and shape of this Irish setter ore exceedingly difficult to dry defect-free without treatment with polyethylene glycol, which is 100 percent effective in preventing seasoning degrade.

Treating Schedules

The following tabulation shows the number of days the carvings were soaked in a 30 percent solution of polyethylene glycol, the temperature of the solution, and the amount of chemical—expressed as a percentage of the dry weight of the wood—found in the outer 1/8 inch of the carvings.

Time Soaked (Days)	Temperature	Glycol (%)
4	140	10.1
8	130	6.7
14	130	8.6
14	65	6.4
21	65	11.8

Drying Conditions

Half of the carvings from each treatment were subjected to rather drastic drying conditions in a conditioning chamber maintained at constant 30 percent relative humidity and 80° F. The remaining carvings from each treatment were simply dried on shelves in a heated shop (average temperature about 65° F.) with no humidity control. In addition, 12 untreated (control) green-wood carvings were dried under each condition.

Results

All of the chemical treatments listed above resulted in 100 percent of the carvings being completely free of splits, surface checks, warp, and other seasoning degrade for both drying conditions. When the untreated controls were subjected to the same drying conditions, 70 percent of the carvings were declared culls or rejects after the drastic drying (80° F. and 30% R.H.), and 25 percent were culls after the moderate (65° F.) drying condition.

No noticeable difference was observed between carvings soaked for different times at various temperatures; all were absolutely free of splits, surface checks, and warp. It appears, therefore, that even lighter treatments would afford adequate protection for walnut green-wood carvings. Possibly very short soaks of from 12 to 24 hours at temperatures of 140° F. to 180° F. would do the job, especially for carvings that are to be dried under moderate conditions.

Maple and Cherry

Although these studies were primarily concerned with walnut, a few black cherry and hard maple carvings were included in treatment No. 2. (8 days at 130° F.). The cherry carvings behaved exactly the same as walnut during drying, although they had about 10 percent less polyethylene glycol in the outer 1/8 inch of wood. The maple carvings, however, behaved quite differently during drying, even though they absorbed slightly more chemical than similarly treated wal-

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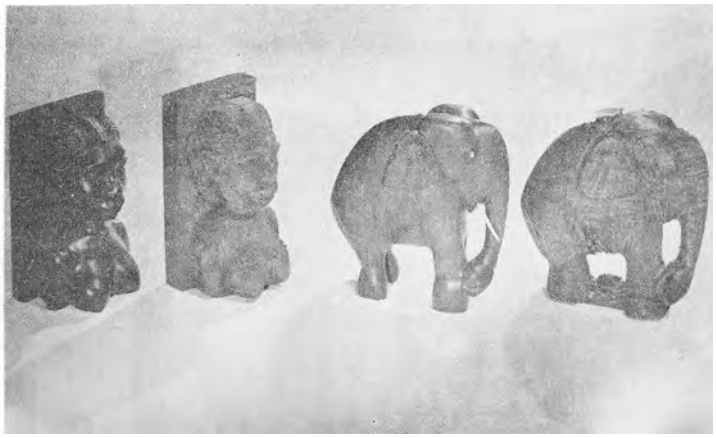
[1] A contributed paper received December, 1960.
[2] Maintained at Madison, Wis., in cooperation with the University of Wisconsin.



ORIGINAL CARVINGS (l.) AND REPLICAS (r.) that were rough-shaped from green walnut, treated with polyethylene glycol-1000, dried defect-free under drastic conditions, and are now ready for final shaping and finishing.

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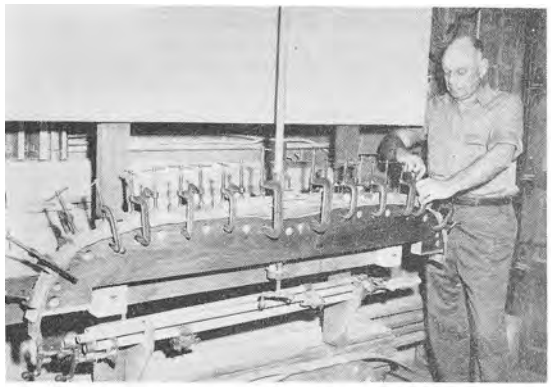
nut. Serious splits developed in most of the maple carvings, including those exposed to moderate drying conditions. Maple carvings evidently require heavier treatment to afford adequate protection during seasoning. This is in line with experience gained working with chemically stabilized walnut and bird's-eye maple rifle stocks.

Dimensional Stability

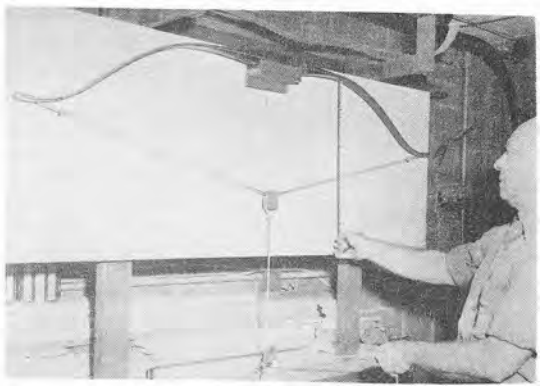
In conclusion, it should be emphasized that relatively light treatments, such as used in these studies, do not result in a high level of dimensional stability in the finished product. If the objective is to treat wood so that it is permanently restrained from shrinking, swelling, and warping, then heavy treatments that result in polyethylene glycol retentions of from 25 to 30 percent are necessary.

Good examples of special products in which heavy chemical treatments are being used successfully to achieve the high level of dimensional stability essential to proper performance include stocks for precision bolt action rifles' and the maple core laminations in composite recurved bows. Even small dimensional changes in critical areas of the stock can throw a rifle barrel ever so slightly out of alignment and thus impair its accuracy. In composite recurved bows, appreciable shrinking or swelling of the wooden (usually maple) core laminations, between the glass faces, frequently result in twisted tips that render the bow useless. According to bow manufacturers, this type of failure is common in areas of high humidity, particularly the Gulf States. Recent tests indicate that such difficulties can be largely prevented by using maple core laminations that have been heavily treated with polyethylene glycol-1000.

[3]"New Chemical Treatment Curbs Shrink and Swell of Walnut Gunstocks," by Harold L. Mitchell and Harold E. Wahlgren. 1959. Forest Products Journal IX (12):437-441.



HAROLD L. MITCHELL in home workshop laminating composite recurved bow on gluing form. Use of chemically stabilized maple veneer for core laminations, between glass faces, prevents bow tips from twisting in hot, humid weather.



"TILLERING" NEARLY FINISHED RECURVED BOW, made of chemically stabilized core laminations between glass faces, to check limbs for action, uniformity of bend, and freedom from twist. Bows are good examples of products requiring heavy chemical treatment.