Creative Project in
Woodbending

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A month before my woodbending class even started I was thinking about a number of projects I would like to devote to the last quarter in my college career. I remembered my past college years as being somewhat hectic with studying, visiting home, working summers and starting another year of school. With this in mind I was hoping that in the future my lifestyle would be a little more relaxed. Nothing sounded more enjoyable to me than a hard day of work, coming home to my family, a home cooked meal and ending up on a porch swing watching the sun go down (John Walton Style). My mind was then settled. A porch swing would be the perfect project.

I soon had a vague idea of how the porch swing would be designed. After looking at other porch swings and obtaining advice from a number of people I put my ideas on paper. The making of any bentwood furniture actually involves two projects: that of making the molds for bending and the furniture construction after bending is completed. While designing the swing, and consequently, the mold shapes, I kept in mind the limiting radius of bend for the type of wood I was using. After the designing work, mold making was my next task.

Molds require dimensional stability and a certain amount of strength. Particle board provides dimensional stability while most common hardwoods will provide adequate strength. My molds then consisted of a particle board top layer, a hardwood middle layer and a particle board bottom layer. These were then mounted on a plywood base.
Tension bands are also a vital part of woodbending. They provide support on the convex side of the bend while maintaining end pressure on the piece being bent. This is necessary because of two stresses that are present while bending: compression on the concave side of the bend and tension on the convex side. Wood can be compressed twenty percent but can only be stretched (tension) two to three percent. The main purpose of any tension band device is then to minimize tension stresses, and subject the wood completely to compression forces.

When bending with the tension band used on my support mold, an action called "backing away" almost invariably occurs. This may be prevented by the use of two steel plates. One plate is clamped on each side of the tension band and the bending stock forcing close contact between the two and ensuring efficient use of all compression forces.

While the mold making was completely under way, I began my search for the wood I would use for bending. Not just any wood can be used. A number of important factors affect the choice of wood for bending purposes. The first is the type of wood to be used. As a general rule hardwoods bend better than softwoods. Each species of wood has a minimum radius to which it may be bent. For my project, white oak was the best bending wood obtainable. Its minimum bending radius is one-half inch when supported by a tension band.

Hardwood species of good bending quality commonly used in industry are listed in the following descending order: white oak, red oak, elm, hickory, ash, beech, birch, maple, walnut, mahogany and sweetgum.

A second consideration is the grain quality of the wood used. While looking at the edge view of the board to be used, it is recommended that the grain should not slope more than one inch in fifteen along the length of that
piece. This is because straight-grained wood will bend with less failures than cross-grained wood. Any wood defects such as decay, cross grain, knots, shakes, pith and checks should be avoided if at all possible because they produce unwanted stresses during bending. Refer to the photographs and the dictionary of terms for explanations of bending failures.

A third consideration is that of the moisture content of the wood. Wood that is too moist will fail quickly under stress. Wood that is too dry will produce failures also. The bending quality of a piece of wood that is too dry may be improved by soaking in cold water overnight. All of these considerations are of vital importance to successful bends. For furniture parts bent over forms, stock at a moisture content of fifteen to twenty percent is recommended. A moisture meter is a most valuable instrument at this stage and accurate enough for virtually all bending purposes.

The bending procedure itself is one of the most exciting steps. This is the point at which all previous steps come together and result in success or failure. To prepare for bending, the stock must be heated in either of two methods: steaming or boiling. As a rule, wet stock should be steamed or boiled thirty minutes per inch of thickness and dry stock one hour per inch of thickness. Neither of these methods actually adds any appreciable moisture to the wood. They are only used as a means for heating the wood. After heating you are ready to bend. The bending procedure should be a fairly quick one. The more time used in bending means additional heat loss in the stock and an increase in internal stresses. My first couple of bends were trial and error. They showed me what type of revisions were needed in the tension band, the mold, and the clamping procedure.
After the bent stock, or billet, has been allowed to stay in the mold for one to three days, it may be removed. However, the shape of the billet must be maintained in some way during the setting process. The billet may be left in the mold for setting purposes but this will greatly increase the time needed for setting. As moisture in the wood is lost during setting, new internal stresses are set up. Under these conditions further failures may result.

Construction of the porch swing was my next step. Since most machining on the bent pieces was done before bending I only had to cut them to the desired shape and length. I then cut all the slats for the porch swing and sanded all the parts before assembly.

Assembly was one of the more time consuming steps due to the number of slats needed. The slats and arm rests were screwed to the five supports and plugs were used to cover the screws. Two other supports, which run the length of the porch swing and may not be obvious in the pictures, are for hanging attachment and functional stability. One is located under the seat and the other is behind the headboard. In addition to the screws a resorcinal resin glue (waterproof) was used on these two supports and the arm rests. After finish sanding, I applied three coats of a marine oil.

Woodbending is an age old art that is used extensively today. The knowledge I have gained in the short time of three months helps me to greatly appreciate the craftsmen who have been doing it for years. But it is somewhat amusing that the piece of furniture I knew would bring hours of relaxation and enjoyment left me with few hours to rest in the last three months of my college career.
backing away ---during bending, when the stock pulls away from the tension band resulting in a loss of compression forces.\textsuperscript{12}

billet ---a term used to describe a piece of solid or laminated wood from which a unit or product may be shaped or machined.\textsuperscript{13}

caul ---blocking materials used to evenly distribute clamping pressure.\textsuperscript{14}

checks ---cracks perpendicular to the annual rings.\textsuperscript{15}

compression adjustment bracket ---a J shaped bracket equipped with a screw and plate that is used to increase and decrease compression forces through end pressure.\textsuperscript{16}

cross grain ---any variation of grain pattern in a straight-grained piece of wood.\textsuperscript{17}

decay ---any type of deterioration in a piece of wood.\textsuperscript{18}

dimensional stability ---characteristic of resistance to change in size of wood due to changes in its moisture content.\textsuperscript{19}

end lever ---any lever attached to the end of a tension band that provides end pressure and a means of leverage for bending.\textsuperscript{20}

knot ---portion of a branch or limb of a tree.\textsuperscript{21}

pith ---the spongy center of the tree.\textsuperscript{22}

setting ---term applied to the drying process of a billet.\textsuperscript{23}

shakes ---longitudinal separations parallel to the annual rings.\textsuperscript{24}

tension band ---any type of band that supports the bending stock on the convex side.\textsuperscript{25}

transition bracket ---a U-shaped bracket that allows the tension band to be changed from one surface of the bending stock to the opposite surface in order to keep the band on the convex side of the bend.\textsuperscript{26}
FOOTNOTES

1 Ray Shackelford, I.E.D. 317, Lecture Series.


4 Peck, p. 4.

5 Ibid., p. 5.

6 Ibid.

7 Ibid.

8 Forest Products, p. 10.

9 Peck, p. 6.

10 Ibid., p. 11.

11 Ibid., pp. 26, 27.

12 Shackelford, Lecture Series.

13 Ibid.

14 Ibid.

15 Peck, p. 5.

16 Shackelford, Lecture Series

17 Peck, p. 5

18 Ibid.

19 Shackelford, Lecture Series.

20 Ibid.
Footnotes continued.


22 Ibid.


24 Ibid. p. 5

25 Shackelford, Lecture Series.

26 Ibid.
BIBLIOGRAPHY


