Bending Tropical Timber

Bending and tropical timbers is an attractive combination –

and one that also makes good sense. The idea is now beginning to spread throughout the producer countries as well. In terms of yield, the process of bending solid wood is a particularly efficient and sparing way to use valuable tropical timber. What is more, bending lends high-grade tropical timber a delicate and buoyant grace while increasing the strength of the material through a more favourable grain flow. Light and shade go together, however, and the less bright side of the wood bending process is that it cannot be used automatically for all species of wood, nor can it be used to produce all imaginable shapes.

Bending tests with tropical timbers

Many of the different species of tropical timber are extremely well suited for making furniture and other objects. Teak, for example, is insensitive to the weather and therefore ideal for garden furniture. Today, teak is only one of many species of tropical timber undergoing bending tests. Potential future users want to know to what extent they can use bending machines and lines in the production of tropical wood articles. Literature on this subject is very scarce however [1, 2]. Indeed, the only better known source describing comparative tests conducted on the bending of solid wood is now nearly 30 years old and hardly up to date any longer [3]. Although it reports on the results of some 150 bending tests, it was in no position to anticipate current trends in the use of what were then uninteresting species of timber. An example is the wood of the rubber tree (Hevea brasiliensis, [4]). On the one hand its processing was long considered to be problematic, on the other hand the wood is available at a very low price. After light was thrown on the main points of its processing, the next question to arise concerned its bendability.

Practical tests produce the answers

Tests were conducted on various tropical timbers in the laboratory of a bending machinery manufacturer not out of scientific curiosity but in order to establish the bendability of the wood for practical purposes. The main objective was to determine the extent to which tropical timbers can be bent by the Thonet method. To ensure the repeatability of the various tests the investigators selected two bending moulds of a radius typically used in the production of chairs. The moulds have an outer radius (inner workpiece radius) of R1=200 mm and R2=300 mm respectively. All the specimens were treated by softening in an atmosphere of saturated steam prior to bending. The tests revealed that the bendability of the timbers can be influenced within certain limits by variation of the bending process. Decisive parameters are the pretreatment by softening and the in-process bending speed. Creases sometimes occur on the inside or lateral faces, but in both cases these can usually be removed by finish-machining (sanding, routing). Obviously, this requires a certain machining allowance. A further phenomenon is radial compression (r.c.), which again can be compensated by a corresponding material allowance. The results of the tests are set out in the table.

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wood species	botanical name	origin	R 1 (200 mm)	R 2 (300 mm)
Maple	acer sp.	Southern China	excellent	excellent
Andiroba	carpa guianensis	Central America	r.c. approx. 15% finishing necessary	r.c. approx. 10%
Cucharillo	trichilla sp.	Central America	good	good
Alder	Alnus jorullensis	Central America	r.c. approx. 20%	good
Rubber wood	hevea brasiliensis	Sarawak (Borneo)	good (*)	good (*)
Teak	tectona grandis	East Java	notable creasing	satisfactory
Imbauba	(n.a.)	Southern China	minimal creasing / good finishing	satisfactory

Remarks: specimen dimensions, mm: 600 x 80 x 35
r.c.: radial compression (thickness reduced by bending)
(*) specimen thickness 20 mm (instead of 35 mm)

Summary

Judging by what is now known about the bending of solid tropical timber, a tree's origin has no bearing on the wood's bending characteristics. What is more important for the question of bendability is the geometry of the bend and the thickness of the workpiece, as it is these two parameters which determine the bending stresses. The more we learn about the bending characteristics of the various species of wood, the easier it will be for furniture designers to promote the use of a woodworking method unrivalled for its simplicity of equipment and economy of operation. After all, it is these two factors which decide ultimately on whether a product is competitive or not.

Literature

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