July 2011

Crosscut

Newsletter of the Witwatersrand Woodworkers' Association
PO Box 411346, Craighall, 2024

➢ Is this the new router with the fixed and plunge bases that will be demo'ed at the next meeting?

Secretary: Ken Mutch (Ken.woodman AT gmail.com or 083 276 2351 - replace AT with @ to email)
Editor: Trevor Pope (tpope AT iafrica.com).
Go to www.wwa.org.za for back issues of *Crosscut*.

Next General Club Meeting on **Wednesday, the13th July 2011** from 18h00 at the WWA clubhouse at REEA. DeWalt will be demonstrating their new routers.

Next Turner's monthly meeting is on **Monday, the 4th July 2011** at 18h00 at the WWA clubhouse at REEA. Peter Middleton is going to do the follow-up demo on working with Pewter. The Wood of the Month is the Combretum family. If you have any samples of work or wood in the Combretum family to show, please bring them to the meeting.

News

Turner's Meeting – 06 June 2011

Buddy Lawson showed some examples of involuted turning with two and four segments. Involuted turning is a two stage process. Firstly, a shape is turned on the outside of a piece which is then divided into two or four segments and rearranged so that the outsides are inside. The reassembled piece is then remounted on the lathe and reshaped. Various design possibilities were shown.

Dries Blignaut showed some techniques for embellishing and carving turnings. He showed a pyrography setup with the capability for two pens and a variety of tips. He also demonstrated a high speed air powered carver. It uses dental burrs and runs at 300,000 rpm. It allows piercing of thin walled vessels and engraving without burning. Some people found the sound disconcertingly like a dental drill. Dries showed how it can be used to delicately pierce a thin pierce of wood without damage or burning. The unit he showed has oil bearings, so an oiler is required. A compressor is required to supply air. The air outlet is onto the workpiece, which has the benefit of blowing away dust, but there is a risk of excessive oil blowing out which can contaminate the workpiece.

Wood of month – Chris van Heeswijk presented Androstachys Johnsonii – Lebombo Ironwood. The term Ironwood tends to be applied to any dark, hardwood in the local area – locally it can be called insimbiti, which means ironwood.

Main Club Meeting and AGM.

The local importers of Gorilla Glue showed their range of products. The flagship product is a poly-urethane glue called Gorilla Glue. The glue setting is triggered by water, has gap filling properties and is water-proof. It copes well with oily woods such as teak, so there are applications where it is likely to be indispensable. They also offer a range of more conventional glues – PVA (white) glue, epoxy, CA glue, and duct tape. Go to www.bestglue.co.za or contact sales@bestglue.co.za or 012-991-6255 for more information.

Club Notices:

Alistair reminded members that we have set a target of 10 toys per member for the end of the year braai.

If you have suggestions for topics for meetings, please approach any of the committee members.

The Open Day has been postponed for later in the year, until a suitable date can be arranged.

The Pretoria Woodworking Club open day will be on the 27 Aug 2011 – at a new venue, location to be advised.

To assist beginners, a short introductory turner's course will be given. It will last one to two hours. Contact the committee to show your interest, so times can be arranged.

Melville Koppies Tree walks. Further tree walks have provisionally been scheduled for October, 2011. Keep an eye open for more details on the web site www.mk.org.za – you are responsible for booking and paying for these courses as individuals.

Wanted:

Woodworking tools for a co-operative run by ex-prisoners. Power tools are needed such as a router and cutters; jigsaw; circular saw; portable drill; drill press; Biscuit jointer. Also G-clamps, T-bar clamps; wood chisels; and various hand-tools are required. This is an initiative run by John's church – please contact John Speedy on 083-359-3149 for more information. Donations can be delivered to the WWA club house at future meetings.

Please Note:

Toymakers. The toymakers meet on the first and third Mondays of every month, at 09h00 till 12h00 at the clubhouse. Contact Eddie Marchio on 011-678-8062 or renato AT pixie.co.za for more information.

Wednesday Workshop. The Wednesday evening workshops are on the first and third Wednesdays of every month, from 18h00 till 20h00. Contact Winston Klein on 011-674-1513 for more information.

Wood Expansion and Contraction

Trevor Pope

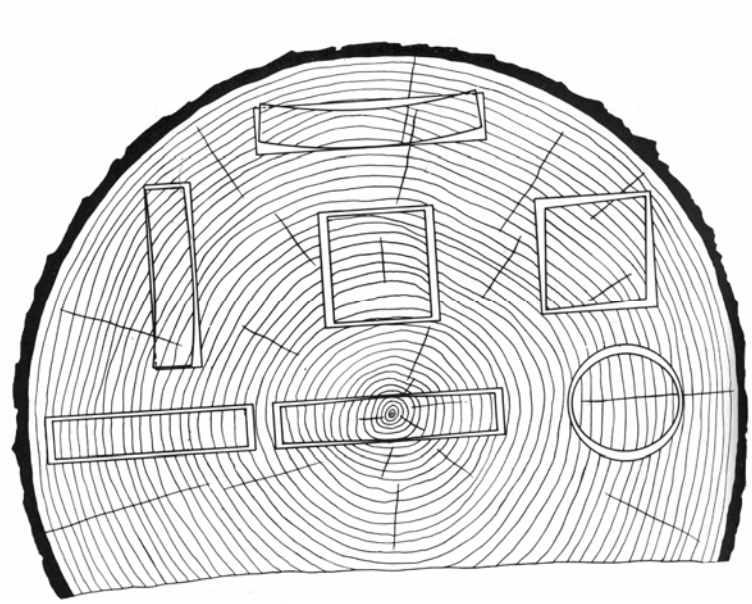
The summer of 2011 in Gauteng was a remarkably wet one – I measured about 1100mm of rain, nearly double the long term average. Autumn has also been quite cool and wet, with higher humidity levels than normal. You have probably noticed lots of sticking doors and drawers. The end of summer is the best time to trim those sticking doors and drawers – they are probably not going to swell much more. Unfortunately, by the time you read this, the air has already started drying out as we slide into winter on the Highveld.

Wooden drawers and door stick because wood swells when it absorbs moisture. In summer, with higher humidity, the higher water content of the air is slowly reflected by the increasing moisture content of wood. We notice this because the wood swells slightly as it absorbs moisture. The process reverses in our dry Highveld winters. The lower humidity levels slowly draw moisture out of the wood, and the wood shrinks slightly.

Fine furniture requires close fitting doors and drawers. However, if you hope to avoid jammed drawers and sticking doors, you need to understand the basics of wood movement.

When wood is performing its primary function of supporting the leaves of a living tree, it is saturated with water. When the tree dies, the wood slowly dries out. If the wood is harvested for timber for furniture and joinery, the wood is seasoned and transforms from a relatively plastic, wet material to a harder, dry material. As the wood dries out it undergoes some changes – it alters chemically and it shrinks. The wood will loose water until it eventually reaches a level that is consistent with the humidity surrounding the wood. This is called the Equilibrium Moisture Content (EMC). A thin sheet of veneer will dry rapidly and then quickly track the environmental humidity. Conversely, a large log will take a very long time to equalize. The rule of thumb for drying or seasoning wood is "a year per inch thickness". This is obviously not a hard-and-fast rule – variables such as temperature, humidity, coatings, air movement, grain direction and wood species affect drying. It does give you an idea of how slow the process can be.

To complicate matters further, wood is not a homogenous material and the grain direction influences how much it changes size. When it dries, it shrinks much more across the grain than with the grain. It also shrinks more in the direction of the rings (tangentially) than across the rings (radially). You will have seen this in how a slice through a tree trunk dries – cracks appear radiating from the centre pith to the outside of the trunk as the cells shrink when they loose moisture. The drawing below shows how wood shrinks as it dries depending on the location in the log. [Source: US Forest Products Laboratory (FPL) book.]



How much does wood shrink as it dries from wet down to the EMC? If you look at tables of wood properties, such as those published by the US FPL, you will see two figures quoted for each species – radial and tangential shrinkage from wet to EMC. Radial shrinkage is typically 2 to 6%. Tangential shrinkage (along the direction of the rings) is typically twice as much – 5 to 10%, but can be up to five times as much. Longitudinal shrinkage – along the grain is small enough – 0.1 to 0.3% - to be neglected.
Some figures are shown in the able below. You can see that they vary significantly between species. There is also considerable variation within a species and even within the same tree. (Turners will bear this out – they will have seen that a succession of bowls turned from the same tree will crack or not, not always predictably.)

Unfortunately, the movement of wood doesn't stop once it has dried out and reaches the EMC. As the humidity around the wood changes, moisture diffuses into or out of the wood. This is gradual and can be almost imperceptible.
All wood moves as the moisture content changes with the seasons, so you need to know how to deal with it and make allowances in your designs. Man-made boards such as plywood tend to be more stable as the alternating grain directions cancel out movement, but it is only reduced and not eliminated. Sealing the wood with paint or varnish reduces the rate of moisture migration in or out, but doesn't stop it completely.

If possible, design so that the movement doesn't matter or is concealed. Allow a table-top to move slightly on top of the base using clever fixings. Allow for gaps around the edges of panels in frame-and-panel doors. Orientate the grain so that movement occurs in the same direction, and not at right-angles. There are many examples to be seen in old furniture where cracks have developed in tops and panels where movement was not allowed for. If you know what to look for, you will often see cracks in old antiques.

The design may require you to allow for some movement, so how much? This depends on the species, the orientation of the grain in the wood and the moisture content variations.

You can see from the table that softer woods tend to shrink less. Also, softer woods tend to behave better, with less cracking as they dry, presumably because there is more elasticity to give as the wood shrinks. Some woods such as Jacaranda are remarkably well behaved, whereas others such as some oaks are very difficult.

How much to allow for? There is no precise answer, because there are too many variables. Here is an excerpt of a table from the US FPL:

Table 14 – 3—*Coefficients for dimensional change due to shrinkage or swelling*

Species	Dimensional change coefficient [1]	
	Radial C_R	Tangential C_T
		HARDWOOD
Alder, red	0.00151	0.00256
Apple	.00205	.00376
Ash:		
Black	.00172	.00274
Oregon	.00141	.00285
Pumpkin	.00126	.00219
White, green	.00169	.00274
Aspen, quaking	.00119	.00234
Basswood, American	.00230	.00330
Beech, American	.00190	.00431
Birch:		
Paper	.00219	.00304
River	.00162	.00327
Yellow, sweet	.00256	.00338
Buckeye, yellow	.00123	.00285
Butternut	.00116	.00223
Catalpa, northern	.00085	.00169
Cherry, black	.00126	.00248
Chestnut, American	.00116	.00234
Cottonwood:		
Black	.00123	.00304
Eastern	.00133	.00327
Elm:		
American	.00144	.00338

For each species, two Dimensional Change Coefficients are given:

- Radial (C_R) – across the rings and
- Tangential (C_T) – along the lines of the annual rings.

These coefficients are the change in size for a **one percent change** in moisture content (MC). The change is not linear, so these figures are based on a MC of 10% ±4%, giving a range of 6% to 14%. In Gauteng, at the end of winter, you can expect a MC of 6%, whereas at the coast, at the end of the summer rainfall season, you can expect around 11%. So one should allow for up to 5% variation.

The US FPL suggests the following calculation:

$\Delta D = D_I [C_T (M_F – M_I)]$

Where ΔD = Change in dimension
D_I = Initial dimension
C_T = Dimension change coefficient in tangential direction per 1% change in MC
(C_T is > C_R so use C_T for the worst case).
M_F = Moisture content (%) at the end of the change
M_I = Moisture content (%) at the start of the change

For example, using the figures in the table for **Cottonwood, Black** which is probably quite close to our local Poplars:

$\Delta D = D_I [C_T (M_F – M_I)]$
Using a value of $C_T = 0.00304$ and a range of moisture content from 6% to 11% = 5% :
$\Delta D = D_I [0.00304 \times 5]$
$\Delta D = D_I [0.0152]$ => 1.52% change in size tangentially

Across a table top of 1 meter width (D_I = 1000mm):
ΔD = 1000mm x 0.0152 => 15.2mm variation from dry, desert to moist, coastal conditions

This is probably the worst you could expect from Poplar. However, it is possible if a piece of furniture is moved from one extreme to the other, so it makes sense to allow for it. The value used for Poplar is pretty typical, but there are some higher ones. Scanning through the table gives several species with C_T above 0.004, and only one above 0.005, so 0.005 is the absolute worst case.

You have probably heard stories of some antique found in the Karoo taken down to the holiday home on the coast, or from the coast to Gauteng: It then cracks or splits. The change in humidity probably caused it. The antique was probably badly designed anyway – not allowing for wood movement, but that is no consolation to the owner.

Interestingly, the movement isn't always fully reversible – sometimes through the winter, the wood doesn't seem to shrink back quite as much as it grew in the summer. I suspect that some internal stresses are relaxing as it expands, and this why it doesn't seem to go quite as far back to where it started.

At the end of April 2011, I took the opportunity to tackle those sticking drawers and doors before they shrank down again for another year. Just a few shavings was all it took to free up two drawers made from beech. On the other hand, two cupboard doors made from Wit Peer (Apodites dimidiata – an indigenous hardwood from the Southern Cape) have grown by a couple of millimeters each, seemingly irreversibly over the last 8 years or so.

Sources:

www.wikipedia.org

Wood Handbook: Wood as an Engineering Material. 1987 US Forest Products Laboratory, reprinted by Sterling in 1989.