

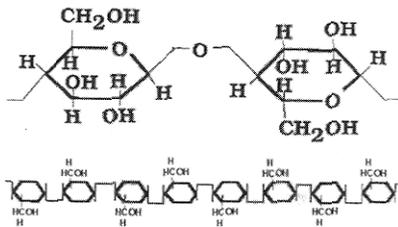
WHY DOES TISSUE SHRINK

By Gary Phillips

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Understanding the molecular structure of paper helps one to understand why it tightens. This overly simplified description of how the paper is made was "lifted" from a search on the Web. Paper is composed of cellulose molecules. Fig 8 shows what cellulose looks like. It is a large molecule built up by linking together a large number of identical units one after the other, like forging a long chain of many links. The basic link is a sugar called glucose. It consists of a ring of carbon atoms bristling with what are called hydroxyl (OH) groups.

FIG 8 The Cellulose Molecule

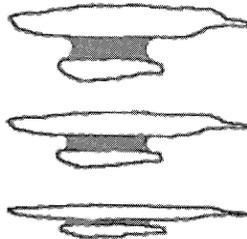


Cellulose is extremely hydrophilic (water loving) and therefore in a wet sheet of paper, after pressing, the fibers would be interconnected by a film of water droplets, and during drying, all the interconnecting water droplets would start to shrink. As the film recedes during drying, surface tension forces bring the cellulose surfaces closer together. Finally, due to the propensity for oxygen molecules to be attracted to hydrogen molecules, linkages between the hydroxyl groups of the adjacent cellulose surfaces create forces which hold them permanently together. This connection between adjacent hydroxyl groups, as oxygen links with two hydrogen atoms, is called a hydrogen bond. It is the hydrogen bond that makes water liquid so that human life is possible, and holds cellulose fibers together after drying so that humans can make paper.

FIG 10 Fibers & Water Droplets



FIG 11
Surface
Tension
Pulling
Fibers
Together



After you've covered your model with tissue, when you spray it with water and then let it dry, you're essentially repeating the process, and as the cellulose fibers draw a little bit closer, the tissue is somewhat tighter than before wetting. Since there's a limit as to how close they can be drawn together, the shrinking process has its limits.