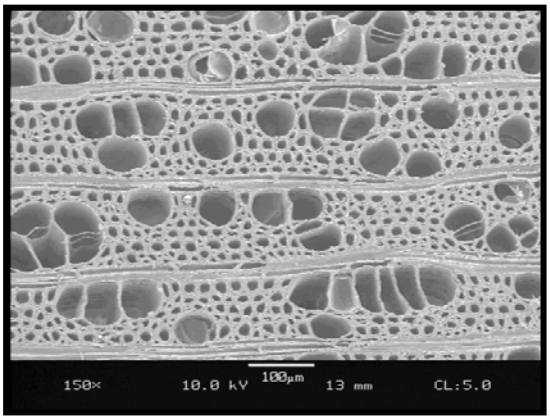
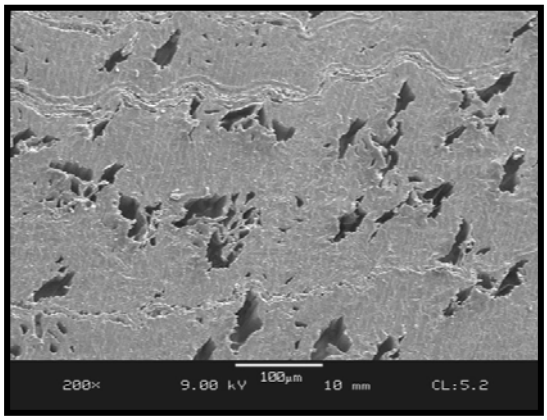
VTC Wood – the next generation wood product

Viscoelastic Thermal Compression (VTC) is a process of modifying wood to increase its strength and stiffness. The process may be applied to any wood species, but it was developed as a means of utilizing wood from intensively managed forest plantations. Most wood grown this way has been intended for pulp and it doesn't have the strength and stiffness needed for applications in building construction. The VTC process uses heat, steam, and mechanical compression to increase the density of wood by a factor of 2 or 3. Proportional increases are seen in mechanical properties.

The key to VTC wood is the ability to achieve the desired compression without destroying its micro-cellular structure. The photomicrographs below illustrate the change in the wood micro-structure due to VTC processing. The image on the left is untreated yellow-poplar as viewed on the endgrain. The image on the right is yellow-poplar VTC wood that has a density of about 75 lbs/ft^3. The voids remaining in the VTC wood are partially collapsed vessels. Note that the cell walls have not been fractured, thus retaining the full structural integrity of the cell walls, but packed into a smaller volume.



Untreated yellow-poplar

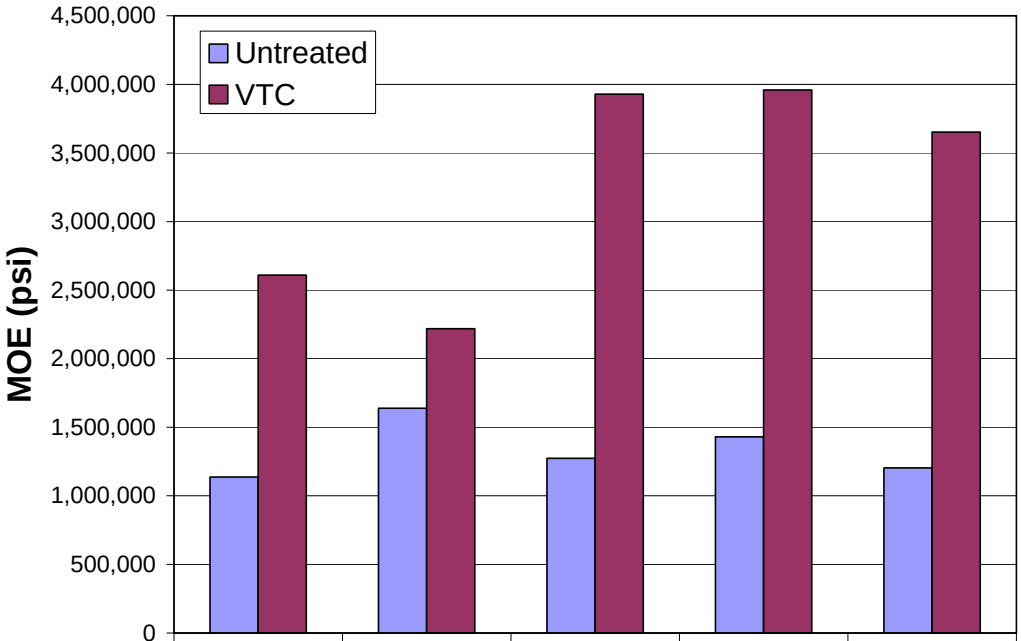


VTC treated yellow-poplar

VTC wood is intended to be used as a component in an engineered composite material. Composites offer an efficient use of materials. They are specifically engineered to provide the properties required for the intended use. While the VTC process adds cost to manufacture, a particular product may only require a small amount of VTC wood to achieve the desired properties. For example, a VTC veneer may be used in the manufacture of a wood I-beam, where the VTC wood is placed only in the outer plies of the flange to take advantage of its superior strength and stiffness. The remainder of the product could be made from normal wood. The VTC process could be used to create veneer with properties that are superior to the highest grade of veneer currently available today.

A benefit of VTC wood is the ability to create the properties that are desired. You don't have to rely on Mother Nature and you don't have to wait 50 years to grow the tree. How much densification occurs, and how much the properties are enhanced, is controlled in

the process. The results shown below illustrate the change in the modulus of elasticity (MOE) for a variety of tree species as a result of VTC processing. The increase of MOE is equal to, or greater than, the proportional increase of density. Other properties that can be improved are bending strength, tensile modulus, tensile strength, and hardness.



	RP	LP	YP	CW	HP
Untreated	1,136,800	1,638,500	1,274,550	1,430,000	1,203,333
VTC	2,610,000	2,218,500	3,929,500	3,959,167	3,652,500

Modulus of elasticity for several wood species before and after VTC processing. RP = radiata pine, LP = loblolly pine, YP = yellow-poplar, CW = eastern cottonwood, HP = hybrid poplar (Boardman, Oregon).

VTC wood has a variety of potential uses. It may be used in composites intended for beams, columns, headers, I-beams, sheathing, flooring, and other products where high strength and stiffness are required. It may be produced from small diameter logs in the form of lumber, veneer, or strands. A log as small as 4-inch in diameter could be used to produce strands, that are bonded together into sheets and then VTC processed into high value laminates. VTC lamina could have a value greater than the highest grade of structural veneer currently on the market. With properties better than virgin wood, VTC wood could find applications for which wood was not previously considered.

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