EFFECTS OF NON-WOOD FIBER USE ON ENERGY USE

Manufacturing Energy

Non-wood fiber, by virtue of its chemical structure and lower lignin content, is easier to pulp and bleach. As a result, non-wood fiber typically requires less overall manufacturing energy. Wood fiber, however, has a significant renewable fuel advantage when chemically pulped, as illustrated in Table N1 below, developed by the Paper Task Force.

Table N1. Comparison of Energy Requirements for Softwood vs. Kenaf Pulp Manufacturing (Source: Paper Task Force 1996)

Millions of BTUs per oven-dried ton of pulp

	Softwood (ECF bleaching) [1	Kenaf [2]
DIRECT ENERGY		
Process energy	22.3 - 24.2	15.2
Bleaching chemical energy	10.2 - 10.2	5.7
TOTAL	**32.5 - 34.4**	**20.9**
SELF-GENERATED ENERGY		
Black liquor	23.8 - 19.0	1.4
Wood waste	4.6 - 2.3	
TOTAL	**28.4 - 21.3**	**1.4**
PURCHASED ENERGY	**4.1 - 13.0**	**19.5**

Notes:
[1] The ECF process used here is D(EO)DD. The discussion of bleached kraft pulping processes in White Paper 10A provides additional detail and references.
[2] We have assumed that the kappa number of the unbleached kenaf pulp is 16. Sandwell Inc., *Kenaf Assessment Study*, draft report prepared for the Tallahatchie County Board Charleston, Mississippi, April 19, 1991, p. 18. The typical kappa number for unbleached softwood kraft pulp is 32.

Agrifibers have an energy advantage over wood fiber where mechanical pulping is involved. Process energy requirements related to mechanical pulping of wood fiber have been reported to be approximately 30% greater and are met largely through electricity that is purchased and/or generated through the combustion of fossil fuels.

In the case of chemical pulping, agricultural fiber has a similar total energy advantage, in part due to its reported amenability to the soda-anthraquinone pulping process, which is less intensive than using the kraft pulping process for wood. Amenability to less intensive bleaching is a contributing factor as well. Unlike the case for wood pulping, however, more than 90% of the energy for agricultural fiber chemical pulping is likely to be purchased and/or generated by the combustion of fossil fuels. Purchased energy requirements for bleached kraft mills are cited in Paper Task Force data to range from 13 to 39% of total required energy. Though total energy required for wood pulping and bleaching may be significantly greater than for agrifiber, its reliance on fossil fuel generated energy is dramatically less than that associated with non-wood fiber pulping.

References

Clay, D.T. 1987. *Kraft black liquor combustion: Advancement in fundamental understanding*. Report No. DOE/CE/40637-T3;IPC-3473-6. Appleton, WI: Institute of Paper Chemistry. http://www.osti.gov/energycitations/product.biblio.jsp?osti_id=7129043

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