EFFECTS OF NON-WOOD FIBER USE ON DISCHARGE TO WATER

Manufacturing Wastewaters

A major impetus for the pulping of wood was the development of a pulping liquor recovery process capable of capturing both the cooking chemicals for reuse and the energy derived from the dissolved wood constituents to reduce the need for additional power generation.

In contrast, the pulping of cereal straws results in pulping liquors that are relatively deficient in energy value, and their silica content brings the potential for fouling the surfaces of conventional liquor recovery process equipment. Alternative approaches for pulping of straw are evolving, but whether they will achieve the related economic hurdles remains to be seen. Absent such developments, management of straw pulping liquors remains a challenge.

Apart from this challenge related to cereal straw pulping, agrifiber wastewater streams are equally responsive to wastewater treatment technologies commonly employed for managing conventional pollutants. Data assembled by the Paper Task Force (see Figure N1) provide representative ranges of wastewater quality.

	Kenaf		Softwood
Bleached chemical pulps	Kraft [1]	Soda [2]	Kraft [3]
Effluent flow (gallons per air-dried ton of	36,000	20,000	18,700
Effluent Quality (kg/air-dried metric ton of			
Biochemical oxygen demand	1.5 - 2.3	5.8	0.3 - 6.7
Chemical oxygen demand (COD)	18.0 - 22.5		14.4 - 72.8
Total suspended solids (TSS)	3.0 - 4.5		0.2 - 9.8

Notes:
All three mills have secondary treatment.
[1] The Phoenix mill produces market pulp from wholestalk kenaf. Reported treatment efficiencies are 97% for BOD and TSS and 87% for COD. V. P. Leekha and S.K. Thapar, "Experiences in Kenaf Pulping in Thailand," *TAPPI Proceedings of the 1983 Pulping Conference* (Atlanta: TAPPI Press, 1983) pp. 288-293.
[2] Sandwell Inc, *Kenaf Assessment Study*, draft report prepared for the Tallahatchie Board of Supervisors, Charleston, Mississippi, April 19, 1991, p. 16.
[3] Effluent quantity: See White Paper 10A.
Effluent quality: U.S. EPA, *Development Document for Proposed Effluent Limitations Guidelines and Standards for the Pulp, Paper and Paperboard Point Source Category*. Washington: U.S. EPA Office of Water, EPA-821-R-93-019, pp. 6-48 - 49, 10-42.

Figure N1. Relative Effluent Flows and Effluent Quality for Kenaf vs. Softwood Fiber (Source: Paper Task Force 1996)

Lower lignin content and differences in cell structure generally contribute to less intense mechanical or chemical processes required to pulp and bleach non-wood fibers. These structural differences also contribute to lower discharges of substances contributing to chemical oxygen demand (COD). Effluent standards in the U.S. for bleached kraft mills where pulp and fine papers are produced reflect annual average allowable discharges of 3.09 and 6.59 kg per air dried metric ton for biochemical oxygen demand (BOD) and total suspended solids (TSS), respectively (*Federal Register* 1998). COD is not typically regulated in North America.

Treated effluent quality cited in Figure N1 suggests that effluent quality comparable to that associated with bleached kraft pulping of softwood would require less intense wastewater treatment. Note that despite potential advantages such as this, the “Phoenix mill” mentioned in Figure N1 reverted to pulping bamboo and planted eucalyptus (Stalk, Frese, and Alexandersen 2003), with kenaf amounting to only 5% of the mill fiber supply, due to inadequate kenaf supply for economic reasons.

References

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