papro NEW ZEALAND

REFINING AND PAPERMAKING PROPERTIES OF EUCALYPT, MIXED HARDWOOD, AND SOFTWOOD MARKET KRAFT BLENDS

R. Paul Kibblewhite and Catherine L. Brindley

Compared with eucalypt pulp, mixed hardwood pulp responds differently to refining and has inferior strength and optical properties. Mixed hardwood:softwood blends are weaker than eucalypt:softwood blends, but have equally good optical properties. Mixed hardwood:softwood and eucalypt:softwood 80:20 blends have similar properties regardless of the fibre quality of the softwood component of the blend.

Mixed hardwood:softwood 80:20 blends have freeness and strength properties similarly developed whether separately refined or co-refined at 0.5 Ws/m, with co-refining at 1.5 Ws/m giving inferior results. In contrast, eucalypt: softwood blends have freeness and strength properties most developed after separate refining, with co-refining at 1.5 Ws/m giving better results than at 0.5 Ws/m.

Radiata pine and northern softwood market kraft pulps can have different refining requirements, reinforcement strengths, and optical properties, but such differences decrease with decreasing proportions of softwood fibre included in eucalypt:softwood pulp blends[1,2,3]. Thus for 80:20 eucalypt:softwood blends, refining, reinforcement, and optical properties are similar when the softwood component consists of either northern species or radiata pine pulp. It is only with refining energy demand that the 80:20 eucalypt:northern softwood blend may have an advantage over corresponding radiata pine blends. With co-refining, energy requirements are increased, reinforcement strengths (tear/tensile properties) decreased, and optical properties improved when compared with effects of separate refining.

Eucalypt market kraft pulps are known to be of high uniformity and to give papers of high bulk, stiffness, and opacity when compared with mixed hardwood pulps[4]. The present paper describes the refining and papermaking potentials of mixed hardwood:softwood blends compared with those of eucalypt:softwood blends. Market kraft pulps used in the blends include mixed hardwood from Japan, eucalypt from Brazil (Aracruz), radiata pine pulps of low (Low) and medium (Medium) coarseness, and a benchmark pulp from the interior region of British Columbia (McKenzie). Hardwood:softwood blends are in proportions of 100:0, 80:20, 50:50, and 0:100 and effects of separate and co-refining are assessed using a laboratory scale Escher Wyss conical refiner at several specific edge loads, a unit which is considered to give results indicative of commercial-scale refining operations.

Mixed Hardwood, Eucalypt, and Softwood Fibre Properties

For the mixed hardwood pulp, fibre lengths are roughly the same, fibre coarseness values are high, and relative numbers of fibres per unit mass of pulp are low, when compared with the eucalypt pulp (Table 1). Although mean fibre lengths of the eucalypt and mixed hardwood pulps are roughly the same, corresponding population distributions are very different[5]. The mixed hardwood pulp has the broadest distribution of fibre lengths and the highest proportion of fines—about 2% weighted by length compared with 0.2% for the eucalypt pulp.

The Medium and McKenzie pulps have almost identical mean fibre lengths but very different coarseness values (Table 1). In contrast, the Low pulp contains shorter fibres of coarseness intermediate between those of the Medium and McKenzie furnishes. As expected, the eucalypt and mixed hardwood fibres are roughly one-third the length and coarseness of the softwood fibres.

Table 1: Fibre length and coarseness, and numbers of fibres

Pulp	FS-200 fibre length* (mm)	FS-200 fibre coarseness (mg/m)	Relative number of fibres
Eucalypt	0.76	0.075	940
Mixed hardwood	0.78	0.096	715
Low	2.26	0.237	100
Medium	2.50	0.271	79
McKenzie	2.49	0.176	122

*Length weighted

Pulp and Blend Refining Properties

The eucalypt and mixed hardwood pulps, when processed alone, show similar trends in their response to refining. Treatment at 0.5 Ws/m is most effective, and at 2.5 Ws/m least effective, in developing tensile strength (Figure 1). Throughout the refining range, the mixed hardwood pulp has lower tensile strength than the eucalypt pulp.