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9. ABSTRACT

This addendum establishes the suitability of increasing the number of species and the range of specific gravity of these species for the production of thermomechanical pulp for use in the manufacture of newsprint paper. With the exception of brightness, which was lower than commercial standards, acceptable quality newspaper was produced from a furnish containing 70 per cent bleached thermomechanical and 20 per cent bleached kraft pulps, both made from the same Philippine hardwoods mixture, and 10 per cent long-fibered kraft pulp.

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ADDITIONAL NEWSPRINT FROM A MIXTURE OF 24 LOWER

DENSITY PHILIPPINE HARDWOODS

By

JAMES F. LAUNDRIE, Chemical Engineer
and
DONALD J. FAHEY, Forest Products Technologist

January 1977



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"Newsprint from Mixtures of Philippine Hardwoods"

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Summary

This addendum establishes the suitability of increasing the number of species and the range of specific gravity of these species for the production of thermomechanical pulp for use in the manufacture of newsprint paper. With the exception of brightness, which was lower than commercial standards, acceptable quality newspaper was produced from a furnish containing 70 percent bleached thermomechanical and 20 percent bleached kraft pulps, both made from the same Philippine hardwoods mixture, and 10 percent long-fibered kraft pulp.

Experimental

Wood Mixture

Twenty-four species of Philippine hardwoods were used to make thermomechanical and kraft pulps for a newsprint paper machine trial.

¹Maintained at Madison, WI, in cooperation with the University of Wisconsin.

As shown in table 1, there was roughly an equal amount of each species, and the maximum wood specific gravity was 0.568.

Kraft Pulping

Two pilot-scale digestions were made under the same conditions and processed the same as previous digestions made with the 47-species mixture used to provide kraft pulps for the earlier newsprint trials reported in AID Report No. 2, "Newsprint from Mixtures of Philippine Hardwoods." The Kappa number of this pulp was 23.7.

Thermomechanical Pulping

A high-freeness thermomechanical pulp was made at the pilot plant of C. E. Bauer, Springfield, Ohio, and returned to the Forest Products Laboratory (FPL) for further refining. This pulp was refined in a 36-inch-diameter disk mill to a Canadian Standard freeness of 115 milliliters. The unbleached brightness of this pulp was only 35.0 percent in contrast to the thermomechanical pulps made earlier from the three- and five-species mixtures which had brightness values of 54.7 and 51.5 percent, respectively.

Bleaching

The Philippine hardwood kraft pulp was semibleached to a brightness of 85.0 percent in a three-stage bleach consisting of chlorination, extraction, and hypochlorite. The conditions of this bleach are given in table 2.

The thermomechanical pulp was bleached with 1 percent hydrogen peroxide as shown in table 3. Although it was known that 1 percent

hydrogen peroxide would not satisfactorily brighten this pulp for use in newsprint, this level was not exceeded because cost on a production scale would be prohibitive.

Papermaking

Newsprint weighing 32 pounds per 3,000 square feet was produced on the experimental Fourdrinier paper machine from a furnish containing 70 percent bleached hardwood thermomechanical pulp, 20 percent bleached hardwood kraft pulp, and 10 percent bleached long-fibered kraft pulp. The processed pulps were blended in the machine chest and the pH adjusted to 4.5 to 5.0 with sulfuric acid and alum. Dye was not added to the furnish, and the sheet had a distinct yellow characteristic attributed to the thermomechanical pulp.

Results

Pulp Properties

The handsheet properties of both the unbleached and semibleached Philippine hardwood kraft pulps are given in table 4. While the bursting and tensile strengths of these pulps are about equal to those pulps made earlier and reported in AID Report No. 2, the tearing resistance is 20 to 30 percent lower. This difference may have been caused by the exclusion of some of the high-density species in the chip mixture, or perhaps because the chips were in cold storage for more than a year before being used to make these pulps.

The handsheet properties of the bleached thermomechanical pulp are given in table 5. The strength properties of this pulp are

comparable to those of the thermomechanical pulps made earlier. The only deficiency of this pulp is the brightness, which is only 51 percent compared to 66.1 and 67.2 percent for the earlier made pulps. This pulp also had a better scattering coefficient and higher opacity partly due to the lower brightness.

Newsprint

Results of the experimental newsprint made on the paper machine are presented in table 6. This newsprint had good strength characteristics generally in the range of commercial papers. However, the brightness was lower than commercial standards as expected. Newsprint of this quality might be suitable for some local markets but not for the world market. A sample of this experimental newsprint is included in the report.

Conclusions

(1) Thermomechanical pulp with good strength properties, but low in brightness, can be made from a mixture of 24 lower density Philippine hardwoods.

(2) The thermomechanical pulp produced from this mixture cannot be economically bleached to the brightness level needed for producing commercial market newsprint.

(3) With the exception of brightness, which will be lower than commercial standards, acceptable quality newsprint can be made from a furnish containing 10 percent bleached long-fibered kraft pulp, 70 percent bleached hardwood thermomechanical pulp, and 20 percent bleached hardwood kraft pulp.

Table 1.--Philippine hardwood mixture used
to make additional newsprint

Common name	Botanical name	Specific gravity	Amount in mixture
Tangisang-bayauak	<i>Ficus variegata</i>	0.236	4.0
Binuang	<i>Octomeles sumatrana</i>	.242	6.6
Balilang-uak	<i>Meliosma macrophylla</i>	.260	4.0
Kaitana	<i>Zanthoxylum rhetsa</i>	.296	4.0
Ilang-ilang	<i>Cananga odorata</i>	.308	4.0
Anabiong	<i>Trema orientalis</i>	.319	4.0
Hamindang	<i>Macaranga bicolor</i>	.324	4.0
Balanti	<i>Homolanthus populneus</i>	.356	4.0
Mayapis	<i>Shorea squamata</i>	.366	2.8
Malansantol	<i>Sandoricum vidalii</i>	.394	7.4
White lauan	<i>Pentacme contorta</i>	.401	6.3
Tulo	<i>Alphitonia philippinensis</i>	.422	4.0
Tangile	<i>Shorea polysperma</i>	.429	2.6
Pahunan	<i>Mangifera altissima</i>	.435	1.6
Apanit	<i>Mastixia philippinensis</i>	.447	4.0
Lago	<i>Pygeum vulgare</i>	.451	2.8
Bagtikan	<i>Parashorea plicata</i>	.478	4.0
Sakat	<i>Terminalia nitens</i>	.485	4.0
Red lauan	<i>Shorea negroensis</i>	.510	4.0
Itangan	<i>Weinmannia luzoniensis</i>	.526	4.0
Piling-liitan	<i>Canarium luzonicum</i>	.549	4.0
Lomarau	<i>Switonia foxworthyi</i>	.559	5.3
Malabetis	<i>Madhuca oblongifolia</i>	.560	2.2
Dangkalan	<i>Calophyllum obliquinervium</i>	.568	6.4

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Table 2.--Bleaching of Philippine hardwood kraft pulp
used to make additional newsprint

Stage ¹	Chlori- nation	Extrac- tion	Hypochlo- rite
Chemical:			
Name.....	Cl ₂	NaOH	NaOCl
Amount applied.....pct	6.8	2.0	1.8
Amount consumed.....pct	6.5	--	1.5
Temperature.....°C	25	72	38
Consistence.....pct	1.9	8.8	10.6
Duration.....min	60	60	180
pH:			
Initial.....	2.9	11.6	10.3
Final.....	2.7	11.1	9.8
Brightness.....pct	--	--	85.0

¹Bleach No. 6810.

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Table 3.--Bleaching of Philippine hardwood thermomechanical pulp used to make additional newsprint

Chemical: ¹	
Name.....	H ₂ O ₂
Amount applied.....pct	1.0
Amount consumed.....pct	1.0
Temperature.....°C	80
Consistence.....pct	11.0
Duration.....min	90
pH:	
Initial.....	9.8
Final.....	9.2
Brightness:	
Original.....pct	35.0
Final.....pct	51.0

¹Additional chemicals used were 3 pct Na₂SiO₃, 2 pct NaOH, and 0.05 pct Mg SO₄. Bleach No. 6811.

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Table 4.--Handsheet properties of unbleached and semibleached
Philippine hardwood kraft pulp used to make
additional newsprint

	Unbleached				Bleached			
Beating time.....min	0	18	28	42	0	13	22	30
Freeness (CSF).....ml	605	485	375	255	515	440	340	235
Burst factor.....	35	65	75	87	41	54	65	69
Tear factor.....	114	103	101	93	88	78	73	61
Breaking length.....km	7.0	10.1	11.3	12.0	5.9	7.3	9.0	9.4
Apparent density.....g/cm ³	0.60	0.70	0.71	0.74	0.67	0.70	0.76	0.78
Brightness.....pct	26.4	--	--	--	85.0	--	--	--

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Table 5.--Handsheet properties of bleached
hardwood thermomechanical pulp
used to make additional newsprint

Freeness (Canadian Standard).....ml	115
Burst factor.....	9.2
Tear factor.....	27.6
Breaking length.....m	2345
Apparent density.....g/cm ³	0.42
Brightness.....pct	51.0
Scattering coefficient.....	690
Opacitypct	96.9

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Table 6.--Properties of additional newsprint paper

Machine run No.	¹ 7150
Weight:	
Square meter.....g	52.0
(24 x 36 - 500)lb	32.0
Thicknessmils	3.5
Densityg/cm ³	0.59
Bursting strengthpts	11.5
Tearing resistance:	
Machine directiong	24.4
Cross directiong	29.2
Tensile strength:	
Machine directionp.i.w.	14.2
Cross directionp.i.w.	7.0
Opacitypct	91.3
Scattering coefficient	503.4
Brightness (Elrepho)pct	46.5
Air resistance (Gurley)sec/100 cm ³	18.6
Smoothness (Bekk):	
Wire sidesec	26.1
Felt sidesec	25.7

¹Furnish: 70 pct Philippine hardwood bleached thermomechanical pulp circulated through disk refiner to 110 ml (Canadian Standard freeness), 20 pct Philippine hardwood bleached kraft refined in pump through disk refiner to 400 ml (Canadian Standard freeness), and 10 percent western softwood bleached kraft refined in pump through disk refiner to 610 ml (Canadian Standard freeness).

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