

THE PHOTOMICROGRAPHY OF A JACK PINE SULPHATE PULP  
PROCESSED IN ROD MILLS AND JORDANS

By  
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Introduction

A Wisconsin paper company employs a combination of rod mills and jordans as a means of processing pulp for the paper machine. In order to determine if this processing was modifying the fiber size and surface characteristics in a way most likely to result in a paper of maximum strength properties, a microscopic study of the stock was made.

Seven samples were selected at significant steps during the conversion of a jack pine sulphate pulp to paper for recording the visual characteristics by means of photomicrographs.

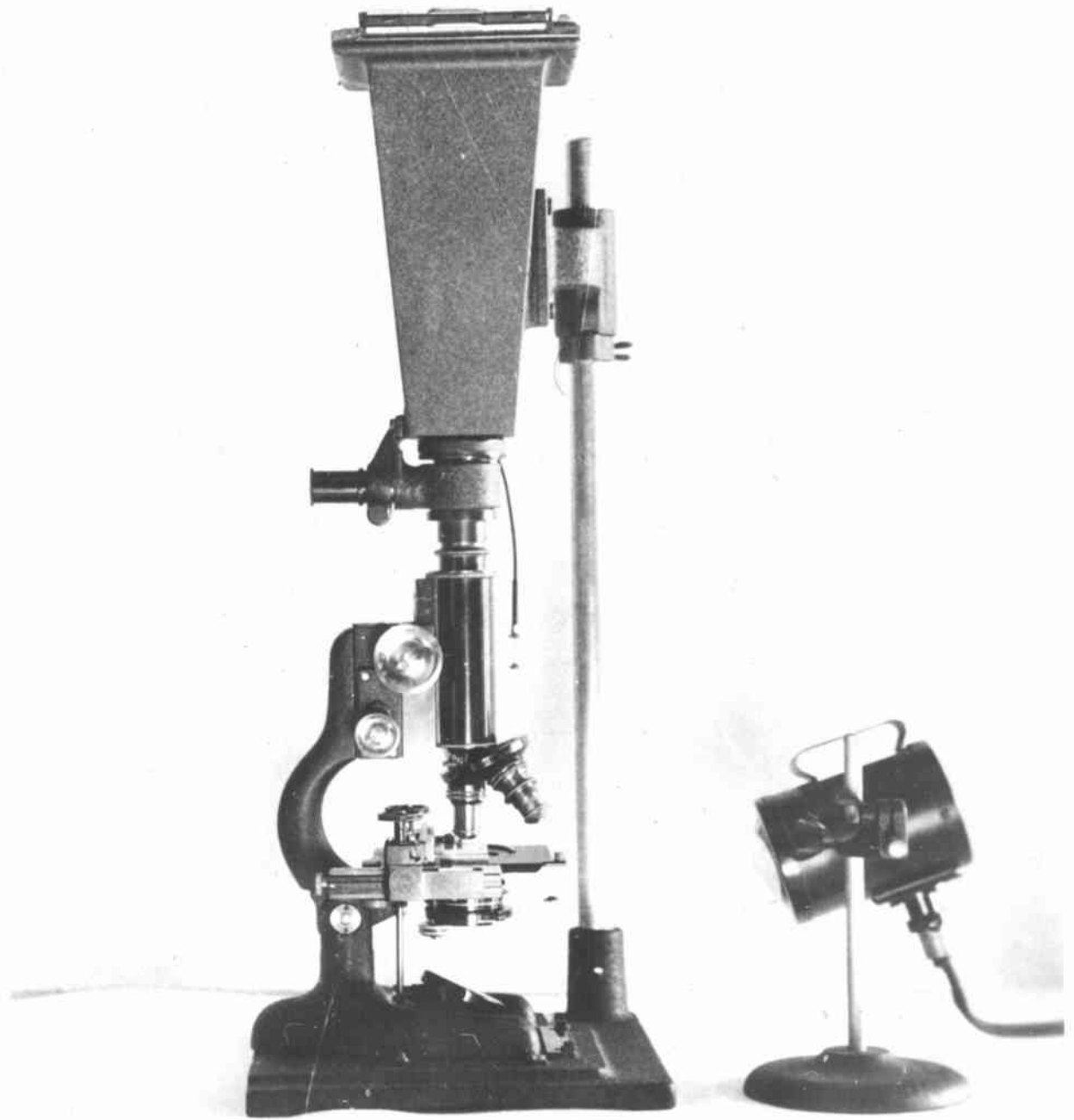
Experimental Procedure and Data

One slide from each sample was prepared and stained with a dilute solution of saffranine dye. The seven slides were examined in the order of increasing severity of processing treatment until the progressive change in the visual characteristics of the stock effected by this processing was recognized. A representative field from each slide was then selected and photographed by the apparatus shown in Plate I at a magnification of 105 diameters. In Plate II are found the photomicrographs obtained, numbered in order of degree of processing.

In Table 1 are recorded data obtained by the paper company concerning the effect of processing by means of a laboratory size Valley Iron Works beater on the strength-producing properties of the pulp before rod milling, after treatment in one rod mill, and after treatment in three rod mills.

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Plate I.--Apparatus used to make photomicrographs.

Table 1.--Strengths developed by small beater in jack pine kraft pulp

Beating time	Unprocessed		Processed by one rod mill		Processed by three rod mills	
	Bursting strength factor	Tearing strength factor	Bursting strength factor	Tearing strength factor	Bursting strength factor	Tearing strength factor
Minutes:	Points	per pound	per ream,	24 x 36 -	500	
0	0.41	2.33	0.68	2.29	0.77	2.18
15	.97	1.53	1.22	1.38	1.52	1.44
30	1.29	1.50	1.54	1.33	1.50	1.32
45	1.57	1.33	1.60	1.28	1.62	1.30
60	1.55	1.41	1.55	1.41	1.64	1.27
75	.....	.....	.....	.....	1.78	1.16

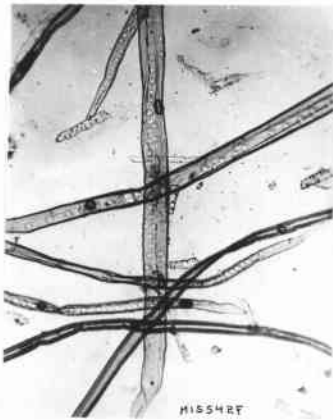
A partial analysis of a sample of the paper made from the pulp processed by three rod mills and four jordans yielded the data recorded in Table 2.

Table 2.--Certain properties of a jack pine kraft paper

Basis weight (24 x 36 - 500).....	Pounds	66.0
Thickness.....	Points	5.6
Bursting strength....	Points per pound per ream	
24 x 36 - 500.....		0.89
Double folds.....	Number	1731
Tearing strength....	Points per pound per ream	
24 x 36 - 500.....		2.30
Tensile strength.....	Meters	5975
Size number.....		2.2
Kind of size.....		Rosin

#### Interpretation of the Data

The photomicrographs indicate that the processing of increasing severity has affected the surface characteristics of the fibers more than their size. The principal effect appears to have been a loosening up and working out of the first two or three outer layers of fibrils of the cell walls. In some instances the fibers have been split lengthwise, thus opened up as ribbons. Naturally, some reduction of fiber



1. Unprocessed



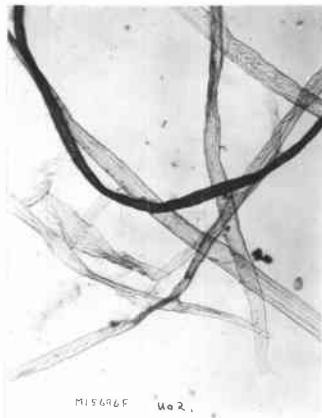
2. Through one rod mill



3. Through two rod mills



4. Through three rod mills



5. Through three rod mills  
and four jordan



6. From paper made out of  
stuff from No. 5

Plate II



7. Sample from No. 4 after  
beating to maximum  
burst in laboratory  
beater

Jack Pine Sulphate Pulp  
Processed by Rod Mills  
and Jordans

length occurred, but the fact that the further treatment of the rod-milled pulps in the laboratory size beater produced a stuff of higher bursting and lower tearing strengths than the paper made from the stuff processed by three rod mills and four jordans suggest that the processing was one of mainly fibrillation.

It is possible that a higher bursting strength could have been secured had the stock been cut more in the jordans. This would have resulted in a lower tear, but one probably not below the limits of the requirements for use.