Alvin W. Boese Papers.

Version 3
August 20, 2018

44145

Paper Making Nov. 30, 1940

Objectives

In a discussion with A. M. Boss the following objectives were arrived at.

1. Specifically to obtain a sheet of paper made from all available fibers for Electrical Paper in place of all As cloth or film in order to ~~get~~ obtain a non-corrosive backing that would be ~~used by some others~~ our paper base patents.

2. To develop improved fibers for use in base backings or for sale to firms such as A B Dick Co. for use in stencils.

3. Immediately, to study the our sheet making process for the purpose of ~~to~~ determining the degree of importance of various processing factors so that we may have adequate reference points on which to base a program of experiments dealing with various paper making materials.

Grant S. Merrill

Experiment 20
Lot A

Experiment 20
Lot B

Experiment 20
Lot C

Experiment 20
Lot D

Lot notebook
Paper Machine

Experiment # 21 12-2-40

35# Durand Flatstock
4500g. weight
15# min mix with 11.5 liters H_2O using lightest nipper

		temp
Lot A	A1	216° - 232
	A2	232 - 242
	B-1	242 - 242
	2	240 - 240
	C 1	240 - 233
	2	
	D 1	239 240
	2	240 240
	E 1	240 240
	2	239 240

Samples

	Porosity	4"x6"	tensile 1 2 3 4 (Ave)	Shear 1 - 2 - 3 - 4	Ave. Shear
A	145 sec	17.5 gr	4 3.7-4-4-4.4	96 - 104	100
B	~~140~~ sec 24	17	6.9-7.1-5.2-6.4-5.4 (5.2)	120 - 88 - 92 - 84	96
C	41	16	5.9-5.7-6.5 (6.03)	100 - 106 - 125 - 132	116
D	76	16.5	10.5-7.5-8.5-10.1-16 (9.3)	120 - 112 - 120 - 108	115
E	110	16	9.5-9.1-7.7-9.6-9.4 (9.06)	108 - 92 - 94 - 96	97.5

Paper, samples of Durand

Experiment 21

	Porosity (sec)	Tensile (lb)	Shear (g.)	4x6 wt,
A	.8	.23 .3	5.7	1 grain
B	1.4	.3	5.6	1
C	2.55	.37	7.2	1
D	4.6	.56	6.9	1
E	6.9	.6	6.1	1

Experiment 19
Lot A

Experiment 19
Lot B

Experiment 19
Lot D

Experiment 19

Lot E

Experiment 19
Lot F

Experiment 19

Lot G

Experiment 19.
2½ hours beating

Experiment 19
6 hours heating

Experiment 19
4 hours heating

Experiment 19
3 hours beating

Experiment 189
3 hours heating

Experiment 19
Lot C

~~Copper Samples~~ ~~Treated~~ Lab notebook Paper making

Experiment # 19

11-28-40

Hot Plate setting 5

9:30 Pulp. 36# Duraad Cryst (Alpha Cell)
11.5 liters H_2O, 300g pulp
15' mix on lab lighting mixer

9:50 took first 400cc sample after 5' circulating — with out
Lot A weight

9:51 Applied 1/5 10g. weight
Drying Start 172° - finish 182°

10:10
Lot B 400cc sample
Dry. Start 232°, finish 222°

10:25
Lot C 400cc sample
Dry. Start 226 finish 226

10:45
Lot D 400cc sample
Dry Start 220 finish 234

11:05
Lot E 400cc sample
Start 230 finish 228

11:25
Lot F 400cc sample
Dry Start 222°F, finish 224

11:45
Lot G 400cc sample
Dry Start 223°F finish 233

over

Experiment 19 All factors are figured per-grain weight

Lot	Porosity (sec.)	Tensile strength (lbs)	Shear (grams)	4x6 weight
A	4.4	.6	10.2	1 grain
B	11.8	.8	9.48	1
C	19	.91	10	1
D	29	1.1	10.45	1
E	53.3	1.22	9.33	1
F	88	1.29	9.3	1
G	160	1.54	8.9	1

Experiment 19

Lot	Porosity	Tensile	Ave lbs	Shear	Ave	Wt. 4"x6"
A	44"	6.1-6.1-4.1-5.7	6	96-112-104-96-102		10
B	112"	6-6.8-9.5-8	7.6	96-96-80-88	90	9.5
C	200"	9.75-9-9.6-10	9.6	104-104-112-110	107	10.5
D	320"	12.7-12.6-11.9-11.5	12.2	118-128-118-96	115	11
E	480	10-12	11	88-84-80-88	85	9
F	880°	12.6-14-13-12	12.9	100-96-88-88	93	10
G	1600	14.5-14.8-15.4-17	15.4	80-76-92-108	89	10
H						

Experiment 18

Pulp. Unbleached Sulphite

Weight 55 00 gram

Samples taken at fifteen minute intervals

Temp dried (18)
183.2°F

18 – C

Temp dried 221°F

(18)

18 – E

(18)

12-9

Temp dried 275°F

Dry temps
Start 272°F
Finish 278°F
Time 3 min

Umschrift (18)

232° F

18 — J

Experiment 18

Unbleached Sulphite from the Northwest Paper Co. The pulp was air dried

Procedure

Use 360 g. pulp and 16 liters water. Mix for fifteen minutes using small lightning mixer

Charge beater with 8.5 liters H_2O

Pour pulp mix in beater and circulate with out heating for 5 min

Put 55.00 g. weight on bed plate arm and beat for 30 min and stop beater using this slurry for the experiment.

Use 400 cc sample for sheets press for 3' @ 100 II

This experiment is to evaluate the various drying temps. Drying and heating of the paper is a factor that greatly effects the finished product.

It is intended here to investigate the effect of various drying temps. using the bed plate furnished with the paper making unit.

this pulp from recently in beater

~~Soiled samples of Treated~~

Lab. notebook

Paper Making

Experiment #18

Sheet Record

	Temps start	Sheet	Temp finish	
Letting 1	84°C (183.2)	A	82°C (179.6)	
	79°C (174.2)	B	76°C (168.8)	
	80°C (176°)	C	84°C (183.2)	177.2
			3 531.6	
	103°C (217.4)	D	104° (219.2)	
	108°C (226.4)	E	105° (221)	
4	109°C (228.2)	F	106 (222.8)	
	103° (217.4	G	104° (219.2)	220.4
	236°F	H	242°F	
5'	232°F	I	232°F	
	232°F	J.	231°F	235
	222°F	K	220°F	
7.5'	229°F	L	223°F	
	272°F	M	278°F	234

Dryer 3'

This experiment was to evaluate the qualities of paper dried over different ranges of temps.

We would appreciate your analysis of our difficulties at your earliest convenience as we do not intend to continue our program until these difficulties are straightened out.

Experiment 18 — All factors are figured per grain of Paper

	Porosity		Tensile		Shear		temp range F.	Ave
A	17.6"		.5 lbs		2.65			
B	19.4"	18.5	.42	.46	3.1	2.875	168.8° to 183.2°	Ave. 177.2
D	10.48				2.5			
F	15		.27		2.33			
G	16.2	13.89	.44	.355	2.95	2.59	214.2° to 222.8°	Ave. 220.4
H	12.8		.41		2.8			
J	13.7	13.25	.426	.418	2.42	2.61	231° to 242°	235
K	12.4		.34		2.14			
L	16.9	14.65		.34	2.8	2.475	270° to 278°	274°

Experiment 18

	Porosity	4x6 wt.	Tensile 1 2 3 4 5 6 7 8	Ave.	Shear 1 2 3 4 5 6 7 8	Av.	
A	300"	18	8 - 8.2 - 8.7 - 9 - 8 - 8.6	8.4	38 40 54 48	45	
B	320"	16.5	6 - 6.5 - 7.5 - 7 - 8	7	52 48 56 48 56	52	48.
D	152"	14.5			32 36 34 40 40	36.2	
F	180"	12	4.5 - 4.8 - 4.2 - 4.6	4.5	28 24 28 32	28	
G	260	16	6.7 - 7.8 - 7 - 6.2	7.1	48 52 44 48 48 44	47.3	37.2
H	192	15	6.3 - 6.4 - 6.4 - 6.2	6.2	32 40 52 44	42	
J	206	15	6.2 - 7.5 - 6.5 - 6.4 - 5.5	6.4	34 40 34 34 40	36.4	39.2
K	180°	14.5	5.9 - 4.1 - 4.8 - 5.3 - 5.1	5.04	34 30 30	31.3	
L	275"	16.5			40 48 46 48 52	46.8	39

Dodite Pulp

Samples taken at fifteen minute intervals

Weight 4500 gram

Sodalite group

17A

Sodalite Syenite

17B

Soluble Pulp

17C

Sodide Pulp

12D

Solite Pulgo

17E

Sodite Pulp

17F

Sodite Pulp

17G

44363

Paper Making #197 11-19-40

Experiment 14 cont.

Conclusions The sheets formed were of a rather open texture with the fibers having an appearance of coarseness. This paper did not seem to have much body. The fiber distribution was also extremely blotchy.

Results of tests run

Lots	Porosity	Tensile
A	sheet not suitable for testing	
B	37.5 seconds	9.1 lbs
C	50"	9.1#
D	55"	9.3#
E	42.5"	9.8#
F		12.5#

It would seem from these results that the individual fibers were not effected to any great extent by the soaking as the sheet formed did not increase in porosity with increased saturation of the pulp. This seems to show that the surface agured a lesser colloidal condition and the fibers retained their original characteristics to a greater extent than when beaten.

The rising tensile curve might be caused by the more complete separating of the fibers allowing better felting of the sheet.

Alvin W. Boese

44362

Paper Making #197 11-19-40

Experiment 14

Reason for experiment: To consider the effect of ~~pulsing~~ soaking the pulps and mixing on Tape Sab. Mixers.

Procedure: Used 360 g. pulps (Sodite) and 11.5 liters H_2O

Take sample every hour, press 3' @ 100# pressure dry setting of 6.5

Use Tape Sab. mixer to agitate the pulps.

This experiment was run 11-13-40

10:00 Started to agitate

Removed 400cc sample

Pulps extremely course, large blotches the pulps ~~sheet~~ ~~taken~~ was not suitable for testing or forming a sheet. ~~[illegible]~~

11:00

Sample A As the paddle had fallen off the shaft, the pulp to this point had merely been soaked for 1 hour. The sheet was extremely rough and blotchy and unsuitable for testing. Small sample saved.

12:00 Sample B

400cc sample. The pulp was fairly well disintegrated although a few pieces of hard pulp were still noticeable

Mixed between 2 pails 10 times

The sheet was quite clear with only a few hard spots noticed Dried 6.5 for 2 minutes

1:00 Sample C Pulps smoother than B sheet did not have hard spots

Dried setting of 6.5 for 5½ minutes

2:00 Sample D

Dried 4'

3:00 Sample E

Dried 4'

44361

Paper Making #193 11-11-40

Experiment 13

Reason. To investigate the effect of various pressures on paper

Pulp: Sodite pulp beaten for 15 min. This pulp was from exp 17 and was taken at the same time as lot A of that exp.

Lot	A	100# pressure for 3'
	B	50 " " "
	C	25 " " "
	D	12.5 " " "

These sheets were all formed on the screen and by mixing 400 cc pulp with 1.7 liters H_2O and mixing between 2 pails 4 times. This mix was poured in the sheet mold and immediately drained

The drying was done at a setting of 6.5

Lot	#1 4"x6" Tests	Cal Ten.	Por.
A		12.6#	134"
B		9.9	21"
C		11.3	40"
D		11.1	26"

Alvin W Boese

Paper Making D 197
Experiment 12

11-11-40

Purpose: To determine wether the 6500# weight used for experiment 11 may have been the cause of the raged beating cycle.

The procedure followed was the same as for exp. 11, the pressing being at 50# for 3'.

Pulp: Sodrite, Northwest Paper Co.
Started beating 10^{25}
Added to beater 1^{15}
Took 1st sample
1^{20} Lot A Drying time 3'

Added 6500 g. weight

1^{35} Lot B Drying time 3'

1^{50} Lot C Drying time 3'

2^{05} Lot D Drying time 3'

The pulp cycle was finished with this lot the elapsed beating time being 4^{15} this being more nearly the same as lot #1 then 10. A lot using 4500 g on the bed sheet will be run to determine if this will approximate the cycle and results of exp. 10

Any tests run will be entered later.

Alvin W Boese

44359

Experiment 11 Paper Making #197 11-8-40

Reason for experiment: To duplicate results of exp. 10 by using a pressure of 50# when pressing

Pulp. Isolite, Northwest Paper Co.

Method Soaked 360 g. pulp in 11 liters H_2O, 2 hrs. 50 min., temp 70°
Added to beater charged with 8.5 liters H O
Slushed around beater for 5' with out weight.
added 6500 g. weight + took 1st sample
~~Dried sheets thing of it~~ Pressed for 3' @ 50#
Dry using a setting of 6.5
Sample 400 cc to be taken at 15' intervals

Lot A Drying Time. Sheet lam. on screen, no sample.

Lot B Drying time 4'

Lot C Drying time 4'

Lots D + E The pulp was beaten to far a feather like formation taking place and also the drainage took well over 3' for each lot.

Cons The beating cycle on this lot was much faster than lot 10 the elapsed time being 55'
~~It~~ It may be that only the 4500 g. weight was used on exp. 10 ~~but~~ but another run will be made using a 6500 g weight to determine if this may have been the error.

Alvin W Baese

10-H

10-F

10-E

10E

10-D

10-B

10-A

10A

44358

Paper Making #193 11-2-40
Experiment #10

Reason for experiment: To determine the effect of a long preliminary soaking of the pulps. Also to increase our knowledge of producing sheets on the lab. paper making equipment.

Pulp: Sodite, Northwest Paper Co.

Method: ~~[illegible]~~ Soak pulp (360g) for 3 hours in 11.5 liters H_2O, temp. 70° F stirring occasionally

Add to 8.5 liters of HO in beater and slush around beater for 5' with out bed plate weights.

Add weights and take 1st sample immediately. Wt. 6500g

Take additional samples at 15' intervals, samples to be 400 cc and add to 1.7 liters of H_2O in pail and pass between 2 yards, 4 times. Add this mix to sheet mould filled with HO to mark and drain immediatly

Press for 3' at 100# pressure and dry sheet on plate using a setting of 6.5

1.45 Sample A not beat. Drying 4' setting of 5 raised setting to 6.5 dried an additional 8'

3.00 Sample B Dried at 5' for 4' raised to 6.5 dried for about 5'

2.15 Sample C Jam on screen, no sample

2.18 Sample D Drying time 6' @ 6.5 setting

2.30 Sample E Drying time 6' @ 6.5 setting

2.42 Sample F Drying time 4' @ 6.5

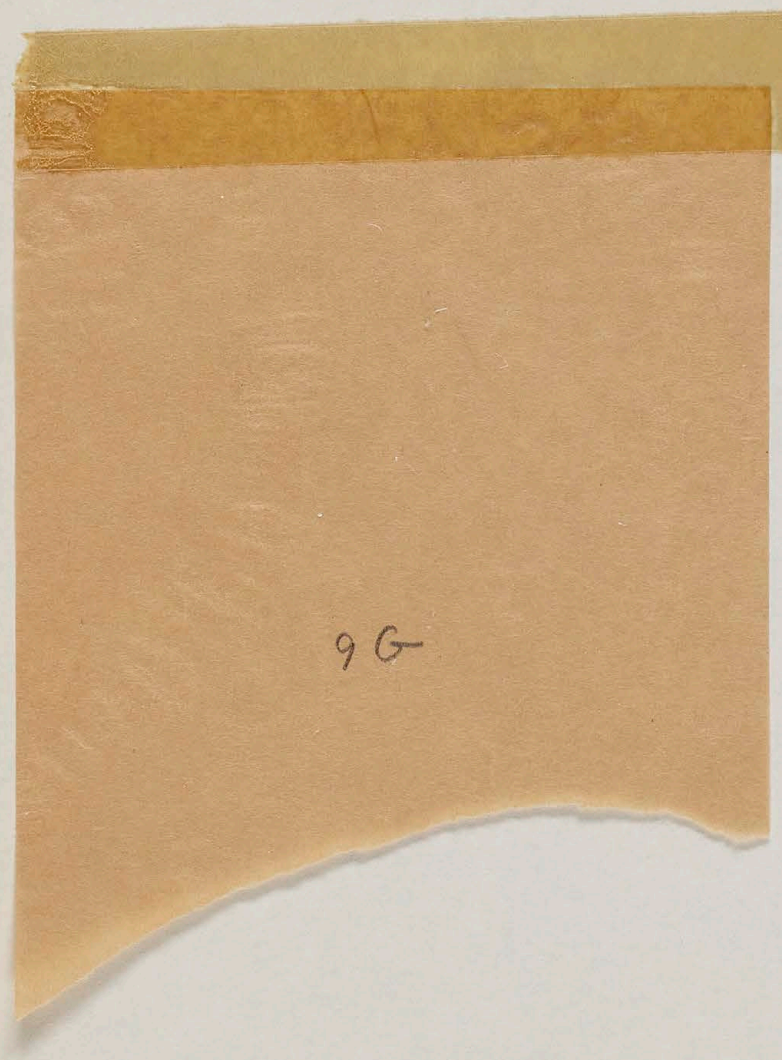
3.00 Sample G Used wrong side of felt sample ruined

3.16 Sample H Pulp beaten beyond usefull stage. Took more than 2' to drain mould box.

	4"x6" wt.	Tests	Tensile (lbs)	Porosity (seconds)
A	17 grs.		4.38#	20.5"
B	17		11.3	111"
D	17		14.64	600"
E	16.5		14.25	1160"
F	16		15.1	2040"
G	no sample			
H	16		16	2400"

Conclusions: As compared to exp. 8 it would seem that the preliminary soaking decreases the hydration and beating time of the pulps by about one quarter

Alvin W Boese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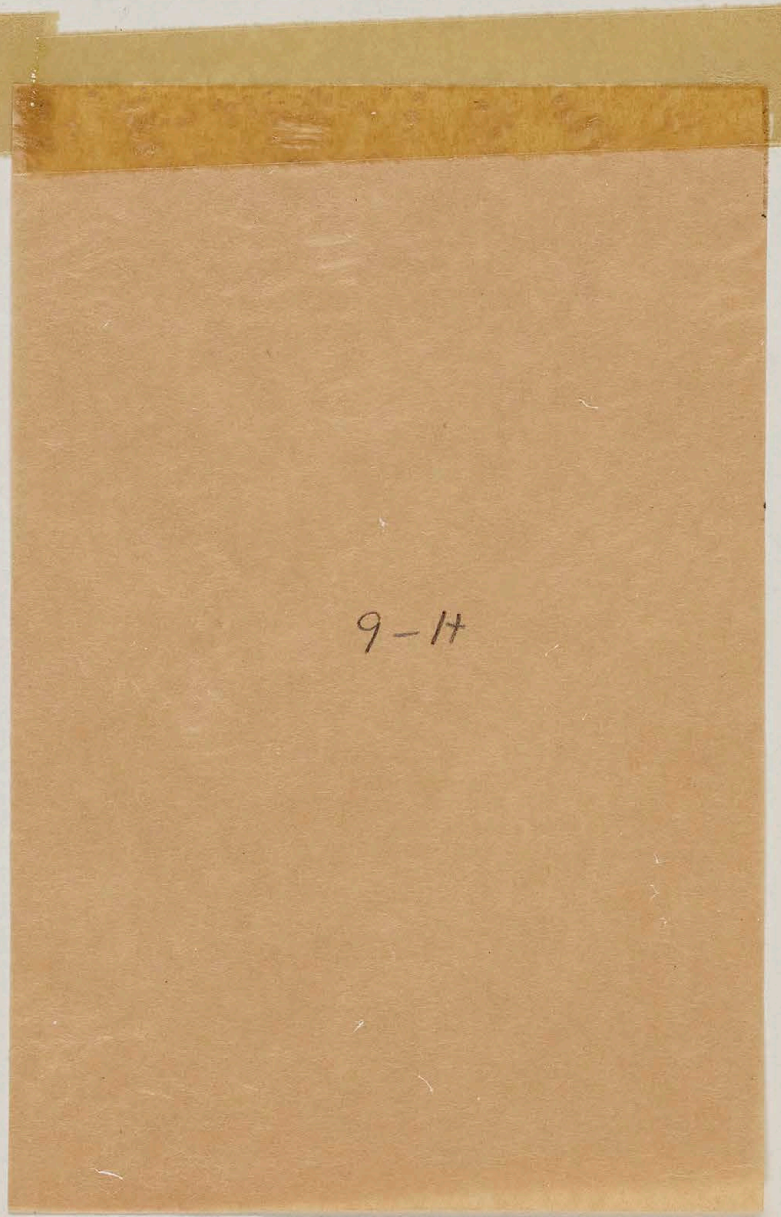
9-11

8-J

8-I

8-H

8-G

8-F

8-E

8-D

8-B

Paper Making #197 11-5-40

Exp. 8

Reason for the experiment: To establish a technique for making experimental sheets.

Method of making sheet. Take 400 cc samples of pulp and add to 1.9 liters of H_2O in pail & pour back & forth in two pails four times. Pour this mix into the mold box which is filled with H_2O to a mark 1½' from top and release the water immediately. Set sheet drain for about 1 minute. Couch with 1 felt: press 3' @ 100 lbs: dry setting 6.5

Pulp: Sodite from the North west Paper Co.

9[10] Mixed 360 g. dry pulp in 11.5 liters H_2O and stirred by hand for about 17 min

9[22] Put pulp mix into 8.5 liters of H_2O in beater and ran without weight.

9[37] Put 4500 g. weight on bed plate arm.

9[42] Lot A Took sample experienced difficulty in removing sheet from screen. — no sample

9[55] Lot B 800 cc sample Made sample OK
Dry. time 4'

10[16] Lot C Took sample could not couch, torn.

10[30] Lot D Took sample Removed OK, Dry time 3'

10[32] Lot E Took sample sheet OK, Dry time 3'

10[42] Lot F Took sample sheet OK, Dry time 2'

10[42] Lot G Took 200 cc sample sheet OK, Dry time 1½'

10[55] Lot H 200 cc sample torn, when couched from screen

11[16] Lot I 300 cc sample sheet OK

11[27] Lot J. 300 cc sample sheet OK

Alvin W Boese

4435-4

Paper Making 197 11-4-40

Experiment 7

Pulp: Sodlite, Northwest Paper Co.

The pulp batch was formed and beat in the usual manner but all efforts to remove sheets undamaged from the screen were unsuccessful.

It may be that the unusual success in couching with the felt was due to the fact that the felt had a surface sizing of some type, which the sheet adhered more readily than to the screen.

Alvin W Boone

6-E

6-D

6D

6-C

6C

6-B

6-A

6A

4435 3

Paper Making # 197 11-4-40

The following table represents some data for the sheets made under experiment # 6

Sets	Ream Wt.	Por.	Tensile	Weight per 4"x6"
A	69.1 #	52.5"	13 1/4 #	28 grains
B	80.2	174"	18 #	37.5
C	30.8	426"	9.5 #	12.5
D	32	369"	11 #	13
E	19.2	400"	6 #	9

Alvin W Boese

44352

Paper Making #197 — 11-2-40
Experiment 6

Pulp: Sodite, Northwest Paper Co.

0' added pulp to 11.5 liters H_2O, temp 55°F, and stirred by hand.

10' charged beater with 11.5 liters H_2O + added pulp & mix, no weight

19' added 4500 g. weight

Lot A 29' Withdrew 800 cc sample from beater, formed sheet pressed for 3' at 100# pressure, couched with felt. Dried for 31' on hot plate

Lot B 41' 800 cc sample of formed sheet
100# pressure for 3', couched with felt.
Drying time 29½'

Lot C 81' 400 cc sample, formed sheet, and couched with felt.
100# pressure for 3'
Drying time 5'
4x6 dry .831 g.
4x6 bonedry .798 g.

Lot D 400 cc sample, formed sheet, couched with felt.
100# pressure for 3'
drying time 3'

Lot E 200 cc sample formed sheet & couched with felt
no data listed

44351
11-1-40

Paper Making #197

Experiment 5 (no 4 was not used there error)

Pulp: Prime unbleached Canvas in dried sheet form from Crown Point

0' Added 300 g. pulp to H_2O + stirred by hand. Temp 50°F

10' Added pulp mix to beater already charged with 11.5 liters H_2O, This pulp did not disintegrate to any amount during the preliminary mixing and the scraps of pulp were only hydrated on the surface. This pulp was added slowly. Temps. 71°F, no weight

16.5' Added 6500 g. weight

Removed 3 successive 800 cc samples at the respective times of 26'.30", 36'.30", and 41'.15", + formed sheets following usual procedure, ~~[illegible]~~ all sheets were destroyed during the couching operation

It was felt that the ~~difficulty~~ lack of success experienced in removing the sheets from the screen was partly due to the hardness of the fiber and lack of hydration

Alvin W Boese

Samples Exp. 3 - B

4435-0

Paper Meeting # 197 11-1-40

Experiment 3

Pulp: Unbleached sulphate pulp, North west Paper Co.

2:15 Added 370 g. (30 g. allows for moisture content) to 11.5 liters H_2O, stirred by hand, temp. 78°F

2:32 Put pulp mix into beater already charged with 11.5 liters H_2O, no weight on plate. temp 70° F

2:37 Put on 6500 gram weight

Lot A 2:43 Formed sheet, 800 cc sample, usual method (mix 4 times in two pails with 1.2 liter H_2O added to box)

It might be well to mention that all work is to follow the procedures set up in T.A.P.P.I. as closely as possible This is to be understood unless otherwise mentioned.

Trouble was experienced in couching this sheet from the screen as it was destroyed in the process.

Lot B 2:46 800 cc sample, formed sheets removed from screen directly on the couch roll with wet felt.
Pressed at 100# pressure for 3', dried on the hot plate

Lot C 3:01 800 cc sample, could not couch sheet from the screen.

It is hard to understand the trouble experienced in couching as all conditions except the pulps were as far as can be determined the same as exp. 1

One condition was noticed and that was that the pulps did not achieve the hydration state reached by the soda pulps.

Alvin W Boese

44349

Paper Making #197
Experiment #2

10-31-40

Pulp: 1½", 8 denier rayon received from the American Viscose Corp., probably a viscose type rayon.

180 g. of pulp was added to the beater directly in 23 liters of H_2O at 70°F

This pulp jammed the roll several times but finally began to disperse and the fibers to shorten from beating.

After about an hours beating the pulp lost most of its wet strength and the fibers were broken & unduly short.

1-A A sheet was formed by taking a 800cc sample from beater and dispersing in 1.7 liter H_2O by pouring from one pail to another 4 times

This mix was poured in the screen box filled to 2" from top with H_2O and the sheet formed

After pressing for 3' at 100# pressure the sheet was dried on the hot plate.

The resulting sheet was extremely weak & friable the paper disintegrating at the slightest flexing.
Sample placed in file, no tests

Alvin W Boese

Exp. 1 - C

Ex 1 – B

Ex 1 – A

~~Ex 1~~

Paper Making #197 10-31-40

Exp. 1

Pulp: Sodite - Northwest Paper Co.

9:15 Charged beater with 11.5 liters of H_2O, 70°F.
Added 360 g. pulp to 11.5 liters H_2O in pail & stirred by hand for 10', temp 70°F

9:25 Added pulp mix to beater, no weight, temp 70°F

9:30 Put 6500 g. wt. on bed plate

Sample A 9:40 Took 800cc sample from beater mixed with 1.7 liters H_2O added to H_2O in [redacted] screen box and released water forming sheet. Removed from screen with felt & couch roll
Pressed for 3', 50 lbs pressure
Dried on hot plate

Sample B 9:55 Took 800cc sample formed sheet as above, pressed & dried as above

Sample C 10:15 Took 800cc sample and followed above procedure.

The sheets formed above were quite heavy, rough, and apparently discolored from the felt which had a brown substance on the surface
No tests were made and samples were filed

Alvin W Bouse

44347

Paper Making #197 10-19-40

Method of forming a united sheet from cellulose acetate fibers and a suitable binder

A very weak sort of paper can be formed of cellulose acetate fibers.

This suggestion deals with a method of increasing the strength of this sheet so that it can be utilized as a paper or have sufficient strength for further treatment.

A paper formed of cellulose acetate fibers by any suitable method such as is regularly used in paper making or by adobing a small amount of some suitable solvent to soften the fibers with out deteriating their characteristics.

This sheet would probably be weak but if strong enough to carry in web form, or on a carrier web the formed sheet could be sprayed with a binder such as one of the synthetic rubbers in solution or a resin or a mixture of both, or rubber latex with adobed ingredients if necessary

Alvin W Boese

1/4346

Paper Making Project #190 9-7-40

Cellulose Acetate Staple Fiber

The following method is suggested as a means of preparing Cellulose acetate fibers for paper making

Make a solution of Acetone and water with the amount of Acetone best suited determined by experiment

Place the Cellulose acetate in this solution and let stand until the fibers have softened somewhat

These fibers might possibly furnish enough binder, so that a sheet of paper could be formed, without the fiber losing its character.

As an alternative the fibers could be dampened [illegible] with Acetone and then dispersed in water.

A W Boese

44137

Project #197 Paper Making — Sept 3, 1940

Discussed with Al Boeri his recent survey of fibers. We tried to determine what our most hopeful point of attack might be in the project. The following items came to mind as things to do:

1. A combination of present rubber-resin paper treatments with a fibrous sheet composed of fibers more water resistant than wood pulp such as Ramie or Flax. Flax is suggested to be stronger wet than dry.

2. The wet strength and adhesion properties of our present rubber-resin treatment should be measured by coating films on wood glass steel cellulose acetate and Cellophane then determine if there is any relationship between these qualities and the paper treating effectiveness.

3. Measure wet vs dry strength of various fibers we have along with dimensions.

Grant S. Merrill

44136

Project #197: Paper Making Aug 8, 1970

While we are waiting for equipment to be ordered ~~—~~ built and installed we are trying to spend our time to the best advantage. In order to do this we thought we might first list all of the types of work that we might have to do and then with the perspective the most pertinent parts of the program can be selected for our first attention.

I Information on materials for sheet forming
1. Waterproof fibers synthetic & natural.
2. Adhesives flexible and waterproof
3. Coatings waterproof, flexible, tack free, & durable.

II Experimental program
1. Devise and evaluate new combinations of materials.
2. Develop methods of sheet forming of various materials.
3. Obtain any unique properties keeping in mind special usages of sheet materials.

III Determine Markets
1. Develop Uses for new combinations
2. Develop combination for new uses.

Grant S. Merrill

44135

Project #197 Paper Making — Aug. 7, 1940

Possible New Products

Mr. Al Boone and I discussed the above subject today and listed some items that might be commercialized in connection with our Paper making project. Generally speaking our first object is to try to determine as soon as possible what in what direction the most immediate commercial possibilities lie.

The following were suggested:

1. Artificial Leather
2. Roofing mulch paper containing fertilizer
3. Tissue for a B B Bird steel manufacturer
4. Impregnated paper for etching and water color
5. Insulating paper.

Grant S. Merrill

44134

Project #197 Paper Making Aug 6, 1940

Information needed

1. Properties of fibers.
2. Technique of felting or paper making.
3. Properties of papers used by 3M.
4. Coatings and adhesives.
5. Films.
6. Textiles
7. Uses of paper and sheet materials.
8. Types of papers being sold, cost, volume and properties.

Objects

1. Increased sales by establishing a new product.
2. Improvement in an old product
3. Cost reduction

Grant L. Merrill

44133

Project #197: Paper Making Aug. 5, 1940

Today I made a written recommendation to Mr. Carlton regarding the project. This was discussed by Mr. Carlton, Mr. Dunn and myself, and it was agreed that we should go ahead on a six month basis. The next step was to write a letter to C. M. Johnson advising him as to the equipment needed and requesting that he prepare an authorization for it. This was done, and I am planning on seeing him as soon as possible.

It was recommended by Mr. Carlton that we direct our efforts to getting a new product just as soon as possible rather than to try to improve tape bandings generally or anything else of a general character.

Grant S. Merrill

44341

Paper Making Project

7-27-40

It is suggested that consideration be given to the thought of manufacturing specialized papers for etching and other similar art work in the event that the 3 M. Co. decide to carry out a program of paper manufacture

While this type of construction may not have a large potential volume it is in a class of its own in that it can carry a premium cost if the quality can meet the requirements.

Following is a resume of the chapter on paper from Joseph Pennels book Etchers & Etching, fourth edition, published in 1936, in which he considers the type of paper necessary for printing etchings

"The qualities necessary for good printing are - that it can be easily and uniformly damped; that it is not brittle or it will tear and crack; that it should take ink and retain it on the surface without spreading or sinking in; and last, but most important, that its color is good"

It seems that old hand made paper preferably over a hundred years old is most desirable for etching

He mentions that some artists like modern Japanese and India papers, but according to Pennel they are in the minority

Also mentioned is the desirability of "tone" preferably a ivory color which certain papers seem to aquire with age

Modern American, English, and German papers are worthless in the authers opinion for etching.

The author mentions the fact that all good etching paper is handmade from linen and cotton rags and alas that sizing is not desirable for the purpose.

At some future date it might be interesting to make a survey of this field and evaluate it for it possibilities

Alvin W Beese

44132

Project #197 Paper-Making July 25, 1940

Asked Al Boese to obtain samples of all standard and experimental papers used by Tape, NOD and Glue board as well as specifications of these papers. The tape dept to be covered first. Myron M. Kee left paper for the Tape lot, Bob Hauchberger for Glue-board and Bob MacDonald for NOD.

Grant S Mcmill

Project #197 · Papermaking

July 24, 1940

Until equipment is available our problem still seems to be to learn something about fibers. I have requested that Al Boese consult with the Purchasing Dept and Thomas Register to find out where we might be able to obtain commercial fibers for our experimental work.

Al Boese is writing letters of inquiry requesting samples and prices of various fibers, animal, vegetable and synthetic

Asked Al Oberholzer to ~~have~~ a patent search made on the subject of the use of synthetic fibers in paper or felt.

Spent considerable time today looking through Chem. Abstract Indexes for 1937 and 10 yr. Index for 1927-1936. Subjects covered were Rayon, Paper Felt and Fibers. Rayon covers synthetic fibers in general.

Grant S. Merrill

44130

Project #197 Papermaking July 23, 1940

Went through Dec. Index 1927-1936 covering the subjects of Paper, Felt, and Fiber. Fiber seemed to be the only subject worthwhile. Abstracts were noted for future reference and a few were read.

Grant L. Merrill

~~44128~~
44129

Project #197 Paper Making July 6, 1940

Paper Making

Hand-Made Papers

Sect. 2 Part 1 The Manufacture of Pulp & Paper Vol IV by Sapozi (2nd edition)

pg 1	The Molds and the Deckle
pg 5	Felts ~~of~~ Vats, Paper Sizing & Finishing
pg 15	Watermarks & Deckle Edges
pg 27	Imitation Hand-Made Papers

Conclusions:-

Our problem may be similar to that of making hand made papers when they try to get equal strength both with and across the machine. This is partially accomplished by running the machine more slowly.

A large amount of experience is needed to make uniform hand-made sheets, and this may be somewhat of a stumbling block in our experimental work.

Grant L. Merrill

Project #197 Paper Making July 5, 1940

Paper Making

Summary

The most important phase of this study at this time seems to me to be to obtain tools and materials to work with. Letters of inquiry have been written regarding the former. Therefore, while we are waiting for information regarding experimental paper making equipment, it seems that the next thing to do would be to learn something about fibers now used in paper-making and probably following that information on synthetic fibers should be obtained.

Materials

Introduction – "Chem. of Pulp & Paper Making" Chapt II pg 40 covers the subject of "Fibrous Raw Materials".

pg 40 The Vegetable Cell

pg 42 Seed Hairs
Cotton (Gossypium).

pg 43 Bast Fibers

pg 47 Whole stems

pg 51 Wood fibers

pg 74 Bulk of Raw Materials (Volume)

Conclusions

The above chapter contained an interesting description of all common paper fibers, but most of the information was not especially pertinent at this time.

Grant S. Merrill

Laboratory Records 44127

Project #197 Paper Making July 5, 1940

Paper Testing Notes (Cont from pg 44126)

Paper Making

pg 482 Bursting Strength

pg 485 Folding Endurance

pg 486 Tearing Test

pg 487 Wet Rub Test

pg 488 Absorbency

pg 488 Expansion & Contraction

pg 489 Volumetric Composition

pg 490 Porosity or Air Resistance

pg 490 Grease Resistance

pg 491 Degree of Sizing

pg 494 Water Resistance

pg 494 Conductivity Particles

Chemical Tests

pg 495 Moisture in Paper

pg 495 Ash Determination

pg 498 Retention

pg 499 Sizing Materials

pg 502 Rosin Determination

pg 503 Starch Determination

pg 503 Brouffin Determination

Grant & Merrill

pg 504 Chlorine

pg 504 Free Acid Determination

pg 505 Sulphur Determination

pg 507 Amount of Coating

pg 508 Glue or Casein Determination

pg 509 Unbleached Fibers

pg 510 Ground-wood Pulp

Laboratory Record
topic

44126 441

Project 197 Paper Making July 5, 1940

Paper Making

Chapt XXI Paper Testing pg 463
in Sutermeister "Chemistry of Pulp and Paper Making"

Note:

pg 463 Microscopical Examination
75 to 150 diam. magnification used.
⅔"- and ⅙"- in. objectives
1"- and 2"- in. eyepieces
give adequate magnification
a substage condenser and iris diaphragm should be included. a stage micrometer and an eyepiece micrometer are very desirable

pg 464 Estimation of Fiber Content

pg 470 % Bleached Sulphite Determination

pg 471 % bleached Sulphite + Sulphite

pg 471 Physical Tests
Effect of humidity on test results

pg 473 Machine Direction

pg 473 Wire or Felt Side

pg 474 Wt of Sample

pg 475 Thickness

pg 476 Bulk

pg 477 Opacity

pg 479 Gloss or Glaze

pg 481 Tensile Breaking Strength

Grant D. Merrill

Laboratory Record
Tape

44125

Project 197 Paper Making

July 1, 1940

Paper Making

Equipment

Called on Mr. Buchanan at Waldorf Paper Products Co. to look at their paper laboratory equipment.

They had a 5 lb beater, a sheet mold, a press and a drying roll. They were satisfied that these were all they needed, but as their equipment was all quite old they recommended that we investigate the newer pieces of equipment now on the market. They gave me three equipment pamphlets.
Met a Mr. Jerry Johnston who works in the lab. also.

Went down to the Mill Bldg. laboratory & spent several hours familiarizing myself with their laboratory paper. I secured a list of 17 firms to contact regarding equipment and testing apparatus.

Grant S. Merrill
July 2, 1940

Wrote letters of inquiry to 17 firms regarding laboratory paper making equipment and testing apparatus.

Grant S. Merrill

Laboratory Records 41124
Lake

Paper Making

Project 197 Paper Making June 29, 1940

Fibers as Raw Material for Paper

In the 4th Edition of Rogers - Manual of Industrial Chemistry there is a chapter devoted to paper starting on page 1050 and the following fibers are listed as having been or as being used in paper manufacture:

Papyrus plant
Inner bark of the mulberry tree
Straw
Wood fibers
Cotton
Linen
Bark
Vegetable nests
Hop vines
Cabbage stumps
Thistle stalks
Burdock
Peat
Old rope
Jute
Flax straw (long strong fibre)
Rye straw } (short weak fibre)
Wheat " }
Rice " }
Hemp
Manila
Sisal
New Zealand flax
Esparto
Cotton seed hull linters
Cotton stalks
Corn stalks

Grant S Merrill

Paper Making

Laboratory Record

tape

4-1123

Project #197 Paper Making June 29, 1940

Artificial leather from Elastic Fibers.

Paper treated by existing techniques is not satisfactory as an artificial leather because it creases or gives to easily. Shoe soles made from solid rubber are warmer than leather because of lack of porosity.

Either of these objections to leather substitute might be eliminated if a felt were made from rubber fibers or synthetic rubber fibers. The elastic character should eliminate gapping trouble and the porosity should make for a ~~[illegible]~~ cooler shoe sole.

If possible this will be investigated later.

Grant S. Merrill

Laboratory Records 44122

Tape

Project 197 Paper Making. June 29, 1940

Introduction

Today R S Drew and I decided that I should start working on a new project having to do generally with the making of specialty papers or felts. This project is to be my primary responsibility and my existing problems are to be eliminated or to be considered secondary as far as it is reasonable to do so. Mr. Drew's responsibility in connection with this project covers that connected with his authorization of the work, and my responsibility covers the activity on the project.

Object:

The general objects of this problem are as follows:

1. To develop an improved paper for Tape
2. " " " " " " W.O.D.
3. " " " " " " GLUE BOND
4. " " " " " " SCOTCHLITE
5. " " " " " " ART. LEATHER
6. " " special paper for sale
7. " combine paper making with treating
8. " replace cellulose fibers with other fibers
9. " conduct experiments that paper mills will not or can not afford to make.
10. To set up specifications for buying paper
11. To build paper mill for special papers
12. To balance tape backing program
13. To compare quality and costs of films, felts and woven sheet materials made from the same material such as Cellulose Acetate.

Procedure:

First we have to obtain information as to the tools, tests and techniques that will be needed to start our experimental program. A study of potential materials, i.e. fibers, should be made.

Grant S. Merrill