Alvin W. Boese Papers.

Version 3
August 20, 2018

Interoffice Correspondence 3M COMPANY

3-8

Subject: Medical Products Applications of Polypropylene Synthetic Paper

cc: E. W. Deziel, 219-1 ✓
G. L. Groff, 207-1W
J. J. McKeown, 207-1W
R. A. Mitsch, 201-1S

Al B.
Pat C.
another approach to specialty fibers?
Ed D.

March 4, 1971

MINUTES OF MEETING

Present: R. W. Stow and J. R. Starkey (DM&S); R. L. Nelson and W. A. Durheim (Medical Products); C. A. Buehler (Central Research)

A meeting was called on March 1 to discuss various applications Medical Products had in mind for the polypropylene synthetic paper under development as an extra high voltage cable insulation. Several months ago, Chuck Buehler supplied Bill Durheim with a sample of polypropylene paper made via the "wet process" (normal papermaking methods) to evaluate as a packaging material and/or valve to permit sterilization with steam or ethylene oxide yet prevent passage of bacteria.

Bob Nelson explained his small Attest® devices for determining the efficiencies of various sterilizers and his problem with the distortion of the spun bonded polyethylene under steam. The spun bonded P.E. is used at the top of the device as a valve. He has experimented with the wet process material impregnated with wax and found it to be an excellent material for his application. Bill Durheim and Marv Hart tested a similar wax-synthetic paper combination to package sterilized materials for hospital use and also had excellent results. Their questions were "Can the material be made in production, and what will it cost?" Since Bob Nelson's device uses very small amounts of material (5-inch diameter circle for a device that sells for $.50 a piece), cost is of minor importance. Bill Durheim feels a manufacturing cost of about $.30 square yard for approximately 5 mil material is necessary in the long range picture for a packaging material.

It was felt that dry process manufacture is the most economical route since the fine fiber normally sprayed on the screen in this process is subsequently collected and cut up in small lengths in the wet process. The better appearance and porosity characteristics of the wet process, it was proposed, is due merely to the conditions for calendering. It was felt by those familiar with EHV development that an adequate material could be made by the dry process. Therefore, the discussion focused in on two questions:

1. Who would do the work and how much would it cost to determine feasibility of an adequate material?

2. What is the long range price picture for such a material?

Therefore, R. Stow, C. Buehler and J. Starkey met again on March 2 to collect the following information:

FEASIBILITY WORK - $1000 - $1500

Basic Web Manufacture - New Business Ventures Pilot Plant

~92 lbs. of material to calendar, costing approximately $800 to make. (8 lbs./hour - 24 hours. Trim away 40% to fit calender width. 80% efficiency in use of raw pellets to fiber.)

Calendaring - Tape Pilot Plant - $300 - $600

Evaluation of Samples - R. Nelson, Medical Products

LONG RANGE OUTLOOK

Attached rough cost estimate, stopping after first trip calendering.

Note: Based on 100,000 square yard runs which is an intermediate if not low volume level. It was felt by J. Starkey that even at this level the cost of the processing in the papermaking step might be lowered by 1/2 to .08 via higher speeds. The EHV material must be run fairly slow to achieve very uniform structure.

C. A. Buehler

C. A. Buehler

/gt

Attach.

COPY

ROUGH COST ESTIMATE OF EHV PAPER

(Based on letter of R. Stow, dated December 11, 1970, using 100,000 square yard runs.)

Paper Making		
Material	$.129	
Proc. at 33#/hour	.177	
	$.306	per lineal yard 38" wide
Rewind Paper		
Above	$.321	
Proc. at 20 YPM	.018	
	$.339	per lineal yard 38" wide
1st Trip Calendering		
Above	$.373	
Proc. at 20 YPM	.048	
	$.421	per lineal yard 36" wide
Extraction		
Above	$.442	
Proc. and Material	.100	
	$.542	per lineal yard 32" wide
2nd Trip Calendering		
Above	$.569	
Proc. at 15 YPM	.059	
	$.628	per lineal yard 32" wide

Jumbo cost per square approximately $.75, excluding all converting waste.

Jerry Wilhelm
December 1970

cc: D. Dosser
J. McKeown
R. Stow

Interoffice Correspondence 3M COMPANY

Subject:

IS UP TO YOU

cc: P. H. Carey - 53-5
W. S. Friedlander - 218-1
M. R. Hatfield - 220-11E
F. M. Metcalfe - 220-6E

March 25, 1971

TO: A. W. BOESE - NEW BUSINESS VENTURES - 53-5

FROM: O. M. WISTE - DESIGNER & SPECIALTY PRODUCTS - 53-3

Representatives from Ford Motor Company visited 3M for two days, March 22 and 23, and were given the opportunity to view some of the recent developments in a variety of product areas (see attached agenda). At our meeting, Ford's spokesman, Mr. O. M. Julien, presented a quite lengthy list of things Ford would like to see developed for their use on present and future model cars. Although most of the items on his list dealt with engineering problems, there was one item that might be of interest to you.

Ford has attempted to develop a vacuum formed upholstery fabric in an effort to eliminate or at least minimize the stitching and sewing necessary with the present methods of upholstering seats. They have had some success but fabrics formed in this manner have not had the proper hand. Apparently they cannot get away from a boardiness that is developed during the forming process.

The concept sounds intriguing; and with your interests in that particular area, I thought you may want to investigate further.

I am certain Fred Metcalfe can put you in contact with the proper people at Ford, probably Mr. Julien.

Those present from Ford:

O. M. Julien - Engineering Supervisor, Resident Engineering and Features
J. E. Hothem - Design Manager, Trim and Color
G. E. Tonkin - Principal Engineer, Advanced Interiors

I can fill you in on more details if you would like. Give me a call, and I will stop by.

O. M. Wiste

OMW/rh
Attachment

FORD MOTOR COMPANY

March 22-23, 1971

AGENDA

MARCH 22

BUILDING 220-6E CONFERENCE ROOM

8:45 A.M. - CORPORATE OVERVIEW - F. M. Metcalfe

BUILDING 230 - ROOM S39

9:45 A.M. - INDUSTRIAL SPECIAL PRODUCTS DEPARTMENT - V. T. Mattison

Fastening Mediums
Exterior Trim
Light Control Films
Impact Absorbing Materials
Improved Headlining Construction

11:45 A.M. - INDUSTRIAL TAPE DIVISION - T. F. Huninghake

Joining Systems Program

BUILDING 222-1 - ROOMS 5 and 6

12:30 P.M. - LUNCH (By invitation)

BUILDING 220

1:30 P.M. - TOUR HALL OF PRODUCTS - F. M. Metcalfe

BUILDING 220-10E CONFERENCE ROOM

2:00 P.M. - VISUAL PRODUCTS DIVISION - Robert C. High

3M Sound on Slide System for training personnel.

BUILDING 207 - ROOM W102

2:45 P.M. - DIELECTRIC MATERIALS & SYSTEMS DIVISION - R. F. Strobel

Metal Finishing

BUILDING 209 - ROOM W118

3:30 P.M. - NEW BUSINESS DEVELOPMENT DEPARTMENT

"NEXTEL" Brand Coatings - J. R. Meyer
Velvet Coating - J. R. Meyer

4:00 P.M. - Glass Bubbles - E. P. Davis

MARCH 23

BUILDING 209 - ROOM 107W

8:00 A.M. - ADHESIVES, COATINGS & SEALERS DIVISION

Structural Foam - Ed. W. Janssen
One Surface Vinyl Roof Top Adhesive - Leon Royer
Automotive Structural Adhesives,
Present and Future - Don B. Koch
Fastener Adhesives - Roger Leinen

9:30 A.M. - DECORATIVE PRODUCTS DIVISION - W. A. Klein

Products for Automotive Interiors
Products for Automotive Exteriors

10:30 A.M. - NEW BUSINESS VENTURES DIVISION

Designer and Specialty Products - O. M. Wiste
Light Control Films - J. E. Johnston

11:15 A.M. - TRAFFIC CONTROL DIVISION - J. K. Grunke

Reflective Fabrics

BUILDING 209-B - NORTH STAR DINING ROOM

12:15 P.M. - LUNCH (By invitation)

Interoffice Correspondence 3M

Subject: Potential New Product

cc W. Boese
dc J.P Ryan
JOE KEERS

NOW ABOUT FOR WEB CLEANERS
MAYBE PUT A LITTLE IN A NON-WOVEN ??
WJ 4/1

CO/ 5/1

March 29, 1971

TO: R. J. MC NAUGHTON - ELECTRO-PRODUCTS LAB - 207-1W

FROM: R. R. CHARBONNEAU - ELECTRO-PRODUCTS LAB - 207-1W

I have made brushes from "PLUTON" H-25 similar in design to those developed by Duplicating Products Division and have found that this brush removes dust from records better than any of the specialty cloths or other devices sold for this purpose.

The carbon fiber brush also is amazingly effective for ordinary household dusting. The dust just jumps from the furniture. I speculate the static charge which normally attracts the dust to most articles is drained off by the carbon fibers and allows the particles to be easily removed.

I would imagine that dusting devices would represent a potentially large market for which our carbon fiber technology would uniquely qualify us.

RRC/bev

cc: G. W. Engdahl - 220-8E
R. H. Dengler - 235-2N
W. S. Friedlander - 218-1 MAR 30 1971
L. C. Krogh - 201-1S

Interoffice Correspondence 3M COMPANY

Subject:

April 8, 1971

TO: W. S. FRIEDLANDER - NEW BUSINESS VENTURES - 218-1

FROM: A. W. BOESE - NEW BUSINESS VENTURES - 53-5

Attached is a summary of work done by our non-woven group in the first quarter, 1971.

Two new areas which will be pursued toward marketable products are those of materials for the knit fabric field and hi temp webs.

The current movement to knit garments for both men and women indicates a need for reinforcing, lining, etc., which will conform to the greater stretch and movement of the knit fabrics. Presently this area is using products which were developed to meet the demands of the rigid woven materials, and this offers some problems in utilizing the qualities of knits. We will define products in more detail as the study proceeds.

Hi temp non-wovens -

We have found that acrylic fiber webs treated at temperatures of 400°F to 600°F can be stabilized at these temperatures to give relatively long working life in areas such as filter media, possibly tape backings, and other uses. This area will be pursued in the second quarter and end product areas defined.

Both of these product areas will be pursued as flat goods and three dimensional molds as the uses indicate.

A. W. Boese
Corporate Innovation Laboratory
New Business Ventures

Form 67-47-E

3M COMPANY TECHNICAL REPORT SUMMARY

DATE: April 1971

TO:
Technical Communications Center, 201-2S

New Business Ventures Div. LABORATORY, DEPT. NUMBER 0551

Title
First Quarterly Report - 1971

Project: 931300-015 932802-006 932901-001 932903-006
932801-006 932806-003 932902-005

Project Number: | Report No: (3 digits)

To:
A. W. Boese

By:
Burton E. Frank

Employee Number:
12365

Objective:

Notebook Reference:

No. of pages including coversheet:
7

MICROFORM COPIES:

cc: D. D. Campbell
P. H. Carey
D. J. David
E. W. DeZiel
M. R. Hatfield
V. W. Marquart
J. R. Starkey

SECURITY

[X] Company Confidential(Open)
[ ] Special Authorization(Closed)

IF SUMMARY REPORT

Has information in this report been covered by other reports submitted to TCC?

[ ] No
[ ] Partially
[ ] Completely

Please keyword information not included in other reports and give page numbers of new material:

_____.

3M CHEMICAL REGISTRY

New chemicals reported?

[X] No [ ] Yes

KEYWORDS

Select general, specific, and 3M product terms from 3M Thesaurus. Enclose suggested terms in parentheses.

3M - NBVD
Non-woven
Quarterly
Fiber
Binder
Curing
Testing
Flameproofing
Drying
Laminating

ABSTRACT and Conclusions. (System can accommodate 200-250 words)

SPECIFIC PROBLEMS remaining to reach objective.

_____ Information Scientist Initials

Project 932801 Evaluation of Fibers

1. Webs for Charcoal Aquarium Filters

Two series of webs were made on the lab card for Ed Perrault to evaluate. Both groups were based on the Medical molded mask formula. These webs were of rather high ream weight. Ed took them, untrimmed, for his tests.

2. Heavy Webs (55#) for Electrical Products

Several webs in a 50-50 blend of each of three standard textile cellulosic fibers with undrawn polyester binder fiber were made on the lab card. A few weeks later, more webs were made using a 5.5 denier cut-tow viscose fiber, also with 50% polyester binder fiber. All these webs were trimmed to 7" x 18" size and picked up by Bob Barton.

3. Work for the Synthetic Leather Group

The polypropylene webs used for synthetic leather are made on a Rando Webber. When the finished double-weight material is sliced in half, the two resulting layers show quite different properties. Probably the variation in properties is caused mainly by the "shingling" always present in Rando webs. Our thought was that a layered web from the lab card would be more homogeneous and might give the finished material uniform properties after the slicing operation. Fiber was ordered from Fairmont, and several groups of extremely heavy webs were made up (RW-240#). By using the larger take-up roller, we were able to make webs about 42" long. Later, we made several webs of about 120# per ream. All the webs were stapled between paper liners and taken by Neil Loeding for evaluation.

4. Rando Webber Webs

Vern Marquart did extensive work on the 12" lab Rando machine and got it working well early in the quarter. When he was satisfied with its operation, he made up several series of webs in varying weights from each of four common fibers -- polyester, polypropylene, regular viscose and high modulus viscose. Representative webs were padded with 20% HA-8 and tested on the Instron tester. Later in the quarter, more regular viscose and high modulus viscose webs were made up in a variety of weights for confirming tests along with comparable webs from the lab card. All were padded with 20% HA-8. Briefly, we have found that light webs with very similar properties can be made on either of the machines. However, the quality and speed of output are much better from the card. This work will continue.

5. BAR Fiber

BAR fiber is an experimental viscose rayon product from FMC, American Viscose Division, which can be water activated (or water-resin activated) to produce a bond when incorporated in a web at between 10% and 20% of the total fiber. Webs were made up of 100% high modulus rayon, 90-10 hi mod-BAR fiber and 80-20 hi mod-BAR fiber. While preliminary work shows promise, definite results will not be obtained until next quarter.

6. Flame Retardant Fibers from Proctor-Schwartz

A small quantity of a flame retardant viscose staple fiber was made up by Proctor-Schwartz and submitted for our evaluation. Unfortunately, in their processing the fiber became so snarled that we could not open it on the card. Small tufts of the fiber seemed to be quite flame resistant.

7. Acrylic Webs for High Temperature Uses

Al Boese has found that webs from combinations of acrylic fibers and acrylic binders show good promise for high temperature uses such as hot gas filters. For his tests we have made up a series of 60# webs on the Rando, using various types of acrylic fibers (which were first opened on the card). Padding with HA-8 completed the webs. Preliminary testing is underway.

8. Synthetic Chamois Skin Wiping Cloth

Vern Marquart has a very promising synthetic chamois skin under development. Fibers are a 50-50 blend of polyvinyl alcohol and polypropylene. Hycar 1571 is the binder. A 30# Rando web is needled, roll-coated and dried. After the drying process, the weight of the finished, shrunken construction is about 200# per ream. A hand ironing of samples between release papers binds down the small quantity of fuzz which is present after the drying operation.

Project 932802 Evaluation of Binders

1. Binder Migration Work

We have observed that the migration of binder-resins in non-woven webs is toward the source of heat during drying. On heavy webs dried by any conventional means, the center of the web is "starved"; and the outside surfaces acquire most of the binder resin. If the wet web is placed on a hot grid, the resin migrates to the contact points and, if colored, gives a pattern of these hot areas. We have purchased a small microwave oven to try to eliminate resin migration during drying. A drying rack of cardboard and fiberglass screen with as much open area as possible to minimize obstruction of the microwaves is used to hold the wet sample webs. We believe that drying in the microwave energy occurs all through the sample simultaneously, both inside and outside. Preliminary work is encouraging -- more work remains to be done in this area.

2. Effect of Coallescent Agents on Web Properties

A joint experiment with Pat Carey has been outlined to investigate the effect of coallescent (and wet edge) agents on the properties of non-woven webs. Two binders (B-15 and HA-8) will be used, with various levels of coallescent and wet edge agents included. The webs of high modulus viscose rayon have already been made and trimmed. Padding and testing will be started shortly.

Project 932806 Web Take-Off

1. Speed-up of Initial Doffer

With the two doffer system on the card (in place of one doffer and a doffer comb), we can practically duplicate the crosswise to lengthwise strength ratios obtained with the Rando webs. The speed of the first doffer has been about 1.6 or 1.7 times that of the second doffer. Herb Walden made a sprocket change which resulted in an increase in initial doffer speed (and also in the speed of the feed apron and feed rolls) so that a speed ratio of 2 to 1 could be obtained between the two doffers. Webs were made before and after the sprocket change to measure any increase in crosswise to lengthwise strength. Also, a comparable Rando web was tested.

	Machine	Doffer Speed Ratio	Ave. 100# TS	% Cross to Length
Fiber - hi mod Type 410 1.5 x 1 9/16"	Rando	--	41.1	76.2
Binder - 20% HA-8	Card	1.6	41.6	71.3
Cure - 2 min. @ 275°F.	Card	2.0	42.8	77.0

It can be seen from the values above that at a card doffer speed ratio of 2 to 1 the strongest material was obtained.

2. Vacuum Doffing

The vacuum doffing system was received, assembled, modified and installed on the lab card for trial runs by Herb Walden. After some adjustments, we were able to obtain a fairly good web. It appeared that with careful control of spacings between and speeds of the components, we could build up both web weight and web randomness. Because of the press of other projects, the equipment had to be removed from the card after a few hours of trial runs. Herb will make further modifications, and then we will re-install the system for more experimental runs.

3. Card Capacity (heaviest, good quality single web)

Our objective here was to determine how heavy a web (of acceptable quality) could be made in a single layer from the card. Also, we wanted to ascertain how much weight is lost due to stretching when winding up layers of a web on the take-up roller. A small amount of stretching is always present because it is necessary to run the take-up roller slightly faster than the take-off apron to minimize puckers and wrinkles.

Feed weights of 15, 18, 20 and 22 grams were tried. Web quality deteriorated badly when the weight was increased from 20 grams to 22 grams. Therefore, we decided to run webs at 10 gram and 20 gram feed levels for our initial comparisons. Doffer ratio was about 1.7 to 1.0. With 10 gram feed and a 3 layer web, we found a ream weight per layer of 4.23#. With a 20 gram feed and also a 3 layer web, the ream weight per layer was 7.83#. A sample of web with the 20 gram feed taken from the apron had a ream weight of 10.5#. Later, more webs were made and padded with 20% HA-8. Feed weights were of 15 grams, 20 grams and 25 grams. Two layer webs were taken from the roller and single layer webs from the apron:

Feed	Apron RW	RW per layer	Web Quality
15g	8.7	6.4	Good
20g	11.5	8.5	Fair
25g	15.0	11.4	Poor

Our conclusion is that with double doffer system on the card, we can make single layer webs of up to 11# ream weight with at least fair quality.

Project 932901 Service to Decorative Products

1. Reinforcing Webs for a Woodgrain ABS Construction

In response to a request from Jack Masters, we made three types of webs for him to try. Two were of hi mod viscose fiber in light and heavy weights and the third was of polyester in a medium weight. All were bonded with HA-16 and cured, giving stiff samples. I observed the laminating process in Building 235, and it appeared that our samples did substantially increase the rigidity of the construction. Tests are underway now.

2. Thermoforming Webs

Another request from Jack Masters was for a completely thermoplastic web for use as a laminating material in a thermoforming operation where deep-drawing was necessary. Eight webs of cellulose acetate in a medium weight were carded and then bonded with B-15.

Project 932902 Service to Molded Masks

1. Impregnation with Softer Resins

After examining the first series of softer masks made last quarter, Paul Hansen requested that we repeat the impregnation of masks with the original six solutions and also add eight more solutions to get a better overall look at the possibilities of using softer resins. Fresh solutions were made up (14 of them) and the sample masks (in two's) were impregnated, dried, weighed and tested for softness. The Medical Products group will evaluate these masks further.

Project 932903 Service to Nuclear Products

1. Dusting Fabric Samples

Many blends of soft fibers were made up on both the lab card and the Rando Webber and then tested for use as dusting fabrics in the several areas where Nuclear Products are trying either to create or to enter a market. Pat Carey has reported in more detail on the composition, testing and properties of these samples in his quarterly report.

2. Rewinding Narrow Rolls of Dusting Fabric

We set up the small rewinder again and made several hundred test rolls for the Nuclear Products group. Most of the rolls were of "Pellon", which is being used as a stop-gap material until something better is available. Widths were 6-7/8", 3-1/2" and 2-1/4".

3. Report on Polypropylene Dusting Fabric

A report on all dates, samples, factory runs, etc. in our development of the original polypropylene dusting fabric was written and sent to Tom Lindsay for possible patent application information.

4. Pilot Rando Webber Run

Laboratory samples of a dusting fabric for cleaning photographic negatives looked so promising that a pilot scale run was set up by Pat Carey for the Building 219 Rando Webber. A fiber blend of 60% polypropylene and 40% cellulose acetate was used. Binder was HA-8. Because only a small quantity of fiber was available for this run, we were restricted in the number of process changes we could make to obtain material closely similar to the laboratory samples. Fortunately, we were able to produce enough satisfactory material to allow slitting and subsequent rewinding into test rolls for evaluation.

Project 931300 Service to Medical Products Lab

1. Thermoplastic Webs for Mask Tie Strings

Jerry Leff asked for sample webs of a thermoplastic nature which could be heat sealed to the mask bodies instead of sewn. Webs were made up from cellulose acetate, polypropylene and a 50-50 blend of the two. Binders used were B-15 and HA-8.

2. Micropore Webs

Two series of webs were made up as possible substitutes for the present Micropore construction, one from regular viscose fiber and the other from polyester. Binders were calculated for 50% resin retention on the finished webs. Nine widely different types of binders were used, including B-15 for controls. Bill Hansen took all the sample webs for testing.

3. Fabric Drapes

A half-dozen runs of fabric drapes were made during the quarter for Jim Eggen, some one sided and some two sided. Several of the runs were to check out new oven-apron materials, steel mesh belts, generally with a Teflon release coating. One run was to make a color match using samples of off-color blue film from Fairmont. Another was to check on the ability of the pad resin to fill any small holes in the polyethylene web. Also, soft vinyl films were tried as possible replacements for the standard polyethylene film.

4. Nine Pound Carded Webs

Jim Eggen, Herb Walden and I made up five rolls of a 9# carded web, each roll about 150 feet long with a paper liner. Jim wants to run this material through the padding section of the Building 219 Rando Webber to compare it in padding properties with a Rando web. Previous webs from garnetts or cards with the normal machine-direction orientation handled much differently from Rando webs, tending to stick more to (and follow) the top pad roll.

A partial listing of people within 3M Company who have consulted with us on non-woven problems during the quarter follows:

Jack Masters	Decorative Products
John Kistner	Central Research
Ed Perrault	Central Research
Paul Hansen	Medical Products
Bill Hansen	Medical Products
Gale Matson	Medical Products
Jerry Leff	Medical Products
Jim Eggen	Medical Products
Joe Petrin	Medical Products
Gay Groff	Electrical Products
Bob Barton	Electrical Products
Don David	Fairmont
Lorin Neuenfeldt	Fairmont
Neil Loeding	Industrial Special Products
Bill Tingerthal	Industrial Special Products
Tom Engels	Industrial Special Products
Ed Janssen	AC&S
Lee Howell	AC&S
Herb Walden	RT & GW
Arne Johnson	International Engineering
Joe Reichert	Nuclear Products
Don Yenni	Nuclear Products
Tom Lindsay	Nuclear Products
Bob Christiansen	Nuclear Products

Burton E. Drake

BEF/rh

Form 6747-1

3M COMPANY TECHNICAL REPORT SUMMARY

DATE: April 15, 1971

TO:
Technical Communications Center, 201-2S

Central Research
Pilot Plant LABORATORY, DEPT. NUMBER 0516

MICROFORM COPIES:

Title
First Quarter Report, 1971

Project:	Project Number:	Report No: (3 digits)
Blown Polymer Microfibers	777500 -	016
To: J. F. Evert		
By: W. E. Lawson, J. C. LaBarre	Employee Number: 19468, 12046	
Objective:	Notebook Reference:	
	No. of pages including coversheet: -6-	

SECURITY
- [X] Company Confidential(Open)
- [ ] Special Authorization(Closed)

IF SUMMARY REPORT
Has information in this report been covered by other reports submitted to TCC?
- [X] No
- [ ] Partially
- [ ] Completely

Please keyword information not included in other reports and give page numbers of new material:

3M CHEMICAL REGISTRY
New chemicals reported?
- [X] No
- [ ] Yes

KEYWORDS
Select general, specific, and 3M product terms from 3M Thesaurus. Enclose suggested terms in parentheses.

Micro/Fiber
Non-Woven/Fabric
(Wide)/Web/Form

ABSTRACT and Conclusions. (System can accommodate 200-250 words)

The BMF Battery Separator was well liked by Western Electric. Additional samples will be sent to them for further evaluation.

The second version of the NRL Cold Air die has been built and has produced relatively good fibers. Efforts next quarter will be centered on getting comparisons with the hot air NRL die.

The NBVD 2-1/2" extruder rate experiment showed that we could make much more fiberable polymer than we could make into good fibers with the present 4 NRL dies. We were able to make good polymer at least at the rate of 130 lbs/hour. This showed that we should concentrate our efforts on die design at this point.

The rotating collector is fairly well perfected and the next step is to build a rotating collector for the NBVD Pilot Plant.

SPECIFIC PROBLEMS remaining to reach objective.

STT Information Scientist Initials

Project 77750002
W.E.Lawson, J.C.LaBarre

BMF Battery Separator

A telephone conversation was held on March 8, 1971, with H. W. Palyermo of Western Electric concerning the status of the lead acid battery separator samples we sent him.

They had completed testing of the samples and liked them very well, although he did say the electrical resistance was a little high. This was due to the small void volume of the samples. I'm sure we can lick this problem by increasing the pore size somewhat. H. Palymero said that this increase in pore size should not make much difference in the other characteristics required of the separator.

The wetting problem that he had with the separator is due, I think, to the pore size. A slightly larger pore size should eliminate this problem.

He requested three things:

1. He would like to try samples with a little larger porosity.
2. Corrugations or projections to help hold the separator in the cell.
3. A price on the material.

I am in the process of making up samples to send to Western Electric, and the following samples will be sent for evaluation:

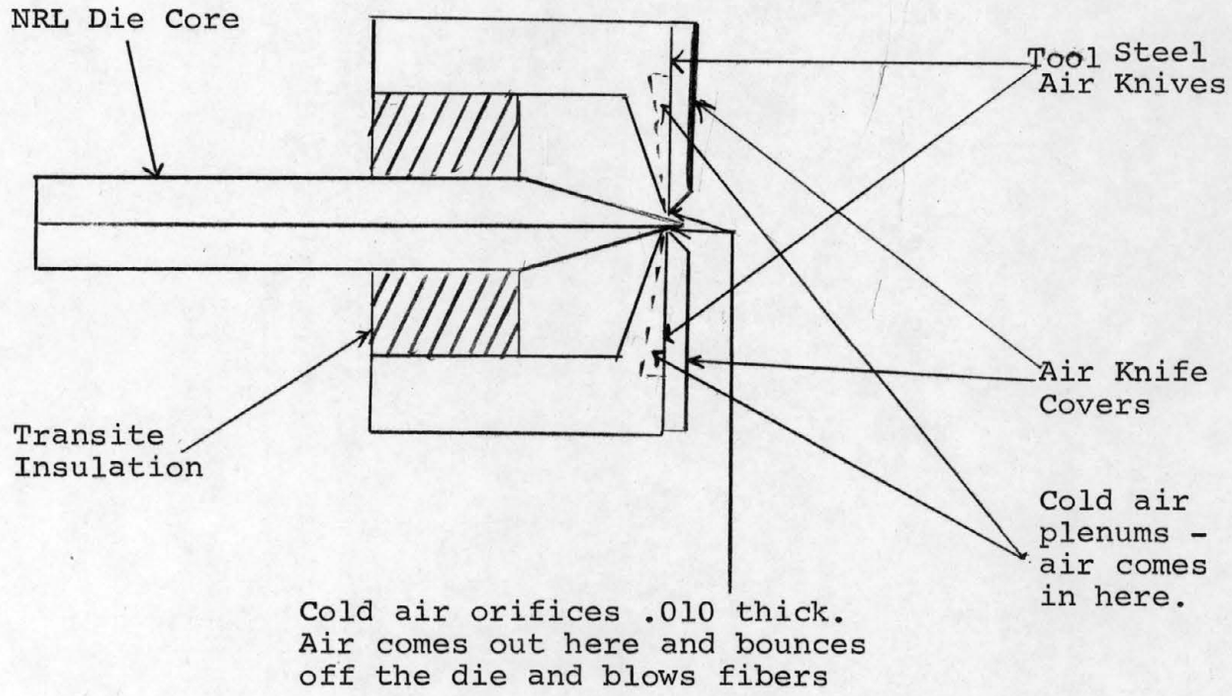
1. A web of a slightly larger pore size, basis wt. of 5 gm/4x6.
2. Corrugated web.
3. Calendared web of about 3 gm/4x6 to see if a thinner web will work as well.

NRL Cold Air Die

A second model of the NRL cold air die was built so as to better control the variables in using cold air.

The major problem in using the square tube air knives was in positioning them correctly. They also had a row of holes instead of a slot for the air to come out of which caused non-uniformities in the air flow.

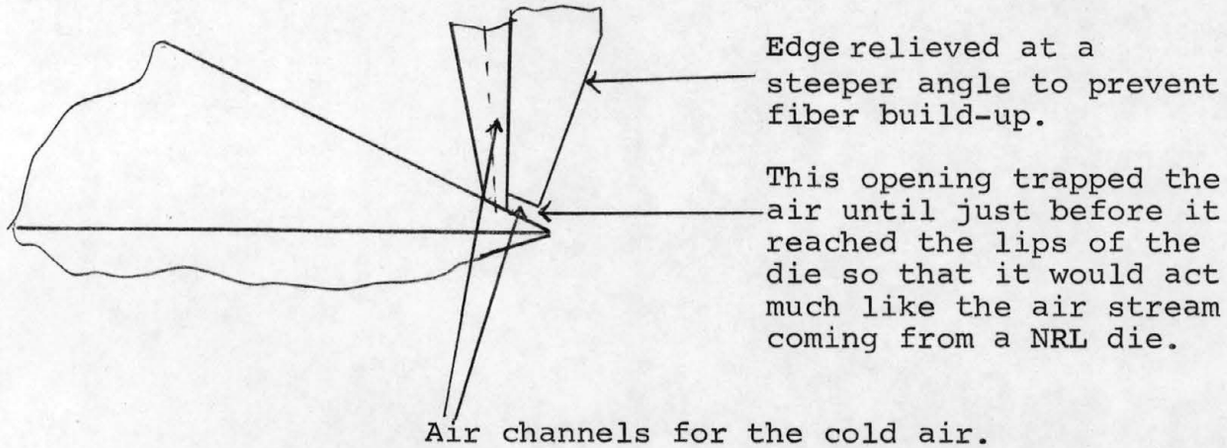
Air manifolds for a NRL die were designed to alleviate the problems found in the die shown in last quarter's report. The side view looked like this:



This die worked reasonably well but it had a tendency to make the fibers curl back and catch on the face of the die.

The steep angle on the edges of the air knife covers made it very hard for the room air that is entrapped by the air stream to enter smoothly. As a result the air blowing out of the knives would curl back with entrapped fibers and the fibers would bond to the air knife.

To solve the problems associated with the first air knife new air knife covers were fabricated. The end result gave an air passage that looked like this:



This die makes nice fibers. The die is not able to make any more pounds/hour of fibers than it could using hot air (for the same quality fibers), but there are some advantages besides the obvious one of using cold air. The fibers can be collected much closer to the die which cuts down on ropiness and makes for a much more uniform web. This is because the air cools the fibers very quickly.

Two sets of air knives are being made for NBVD dies so that NBVD can gain experience in using cold air in production. Work is now underway that will provide a comparison between the hot air and cold air NRL dies to see if the cold air die will offer any significant advantage.

NBVD Rate Experiment

A rate experiment was run at NBVD in February with the assistance of Jerry Starkey and Dick Kinderman to determine what was the NBVD BMF capability.

The purposes of the experiment were two-fold: one, to find the limit of the 2-1/2" NBVD extruder in delivering fiberable polymer to the die; and two, to determine the limits of the present equipment to make oil absorbing webs with a 20 to 1 effectiveness.

The extruder is able to deliver, with the special polypropylene screw, at least 120 lbs/hr of fiberable polymer. The ability of the polymer to fiber was tested by putting a small amount through a NRL die and dumping the rest on the floor. Good fibers were made with the one NRL die operating at 8 lbs/hr.

Webs and the raw material for fluff in oil absorbing were made on February 4th in the NBVD pilot plant in the 2-1/2" extruder utilizing the special polypropylene screw. We were able to make good oil absorbing fibers with an effectiveness of 20 to 1 at a rate of 30 lbs/hr per die. We ran one die at 30 lbs/hr and dumped the resin for the other 3 dies on the floor. We didn't make fibers out of the other 3 dies because the air piping to them was inadequate. This means that we can make at the least oil absorbing polypropylene fibers at 120 lbs/hr. The only thing that kept us from reaching any higher rates was that we had reached the speed limit on the pump motors.

It looked like we could have made more fibers from the die if we had been able to provide it with polymer. The extruder was operating at a melt temp of 730°F. We could have raised the heat to at least 800°F to knock down the resin faster if necessary. Also, we could have delivered more resin with that screw if we could have used it by increasing the screw speed.

The die was a standard 5" NBVD NRL die with a crude cold air cross jet on it. The cross jet is very necessary because it cools the polymer down quicker and gives a much loftier and softer web because the fibers aren't as hot so they don't bond together as much.

Reasonable webs with adequate strength were collected. At a distance of 2 to 3 feet from the die these webs weren't very ropy. An interesting effect of ropiness was noted. If a very ropy web was tested for oil absorption it would absorb as high as 40 times its own weight in oil. The ropes seem to add physical strength to the web so that it can keep a high volume to weight ratio.

BMF Rotating Collector

The rotating collector is fairly well perfected and so little effort has been expended on improving it this quarter. The next step is to build a larger version for use in the NBVD pilot plant and test the rotating collector in actual usage. It looks now as if we may try to scale it up to a pilot plant version about the middle of the summer.

W. E. Lawson

W. E. Lawson/J. C. LaBarre

/f

Central Research Pilot Plant
First Quarter Report, 1971
Project 77750002, W. E. Lawson,
J. C. LaBarre

cc: G. J. Bankers, 230-2S
B. W. Benson, 218-3
A. W. Boese, ~~219-1~~ 53-5
D. L. Braun, 218-1
I. J. Cooper, 218-1
J. F. Dyrud, 230-2S
W. S. Friedlander, 218-1
R. R. Hannula, 230-1S
W. T. Kass, 218-1
L. C. Krogh, 201-1S
H. J. Revoir, 230-2S
J. R. Starkey, 219-1
T. H. Wall, 218-3

Al B.
Pat C.

Any interest ?

Ed

LOCKWOOD GREENE

ENGINEERS ··· ARCHITECTS

1776 PEACHTREE STREET, N. W., SUITE 200
ATLANTA, GEORGIA 30309

LOCKWOOD GREENE AND COMPANY
OF CANADA, LIMITED
MONTREAL

LOCKWOOD GREENE ENGINEERS, INC.
BOSTON
NEW YORK
SPARTANBURG

April 22, 1971

IN REPLY
REFER TO

Mr. E. W. Deziel
New Products Production Manager
New Business Ventures Division
Minnesota Mining and Manufacturing Company
3M Center
Saint Paul, Minnesota 55101

Dear Ed:

I sincerely appreciate the time you spent with me on my recent visit to St. Paul. The visit was most informative and worth while to me and I really feel that it can be of value to 3M.

I have sent information to Bob Anderson, per the discussion in his office. Infact, I tried to call him today and was sorry to find that he is out sick and not expected in for several days. I hope it means he will have full recovery in a few days.

I have not yet heard further from Tappi on the committee activity in the area of nonwovens. However, I have copied a couple of items which I think will be of interest to you. Attached is a copy of the article on Dr. Jappe and the Plastics - Paper Conference in Chicago, September 13-15. Two days of panels and technical papers on nonwovens are just bound to be interesting!

That article refers to page 287, but I am sure the material they are talking about is on page 288 "1971 Plastics - Paper Conference in Chicago".

I will let you know more in the future as I hear it with regard to Tappi and nonwovens.

Thank you for your interest in Lockwood Greene. I sincerely feel we can be of good service to you and to 3M.

Very truly yours,

LOCKWOOD GREENE ENGINEERS, INC.

Bob Clarke

Robert D. Clarke
Manager, Chemical Development

RDC:jme
attachments

6. The 1970 Technical Information Sheets were Mailed to All who Requested Copies. Ten separate subjects comprising 29 sheets were issued.

Annual Meeting

The TOC recommended to the Annual Meeting Technical Program Committee that they should select not more than six broad topics as "feature" sessions to be used for planning Annual Meeting technical sessions. This is an expansion of the "Feature" session idea.

Charter Flights

It was recommended that TAPPI continue to sponsor charter flights and encourage participation of North American TAPPI members at overseas conferences.

Conferences

The Testing Division extended an invitation to other divisions to participate in "back-to-work" conferences.

The approved spring and fall conferences schedule will be published in *Tappi* Magazine under separate listings.

Standing Committees

The TOC has several standing committees which presented various reports, suggestions, and recommendations.

Structure and Performance Committee

Charged with scopes and committee structure the Committee reported on revisions of the Divisions and Committees Annual Status Reports. These new forms should be completed by June and available for reporting the 1971 activities.

Meetings Committee

This TOC Committee recommended that the TAPPI staff establish liaison with such organizations as EUCEPA, CPPA, BP and BMA, APPITA, and Japanese TAPPI in order to avoid future conflicts with TAPPI activities.

TOC Publications Committee

This committee reported on its scope and objectives which were approved as follows: "The scope of the TOC Publications Committee is the administration of publications developed by divisions and their committees."

Objectives

In order to gather together material for TOC's approval or disapproval within the scope of its responsibilities for publications the following are objectives for the committee and publications.

1. To establish procedures for the publication of: Monographs, STAPS, and CA Reports.

2. To administer revisions of the Division and Committee Guidance Manual.

3. To counsel with the Board of Directors Publications Committee on matters of mutual concern.

4. To prepare Annual Reports on the Committees' Activities.

The Publications Committee also reported on 17 TAPPI Monographs in progress.

The TOC reported on a study made relative to conference financing and recommended that TAPPI treat Annual Meeting Exhibits as individual profit centers and that net profit from membership be distributed among the various cost centers such as conferences, publications, and project appropriations. It was also recommended that the special TAPPI Headquarters overhead, asisgned to conferences, be eliminated.

The TOC normally meets three times a year, at the Annual Meeting in February, in June, and in November. If you have any matters which you feel the TIC or TOC should consider, please submit them to the Director of Technical Operations for inclusion in the agenda of the Feb. 25, 1971, meeting.

D. E. Kniska Named Finishing Committee Chairman

Daniël E. Kniska, Production Manager, Finishing, The Mead Corp., Chillicothe, Ohio, has been named chairman of the Finishing Committee of the Coating and Graphic Arts Division for the coming year. The Committee is concerned with the process of modifying the surface characteristics of paper and paperboard, and with the subsequent packaging, handling, and storing operations.

Mr. Kniska earned an industrial engineering degree from West Virginia University and later did graduate work there and at Ohio University. He is a Registered Professional Engineer.

He joined TAPPI in 1966 and has since been active on its Finishing Committee as membership chairman, project officer and, last year, as vice-chairman. He has presented papers at TAPPI meetings at the TAPPI 52nd Annual Meeting in 1967 he spoke on sheeting as a member of a panel discussion group. He is a member also of the American Institute of Industrial Engineers, and of the honorary engineering society, Alpha Pi Mu. He has had articles published in several trade magazines.

A resident of Chillicothe, he is a Director of the Ross County Heart Association.

Winrich to Chair Converted Products Group of Testing Division

Kenneth M. Winrich, Assistant to the Director of Technical Service, St. Regis Paper Co., West Nyack, N. Y., has advanced to the chairmanship of the Converted Products Group of the Testing Division. The group consists of two committees: Paper Shipping Sack Testing and Packaging Materials Testing. Mr. Winrich was named secretary of this Division in 1965 and chairman in 1968.

A 1934 chemistry graduate from the University of Wisconsin, he became a TAPPI member in 1952. He has presented at the 1954 TAPPI Annual Meeting and at the 1967 and 1970 Testing Conferences. At the latter, held in Minneapolis, he spoke on "Dynamic WVTR Testing—An Experience Report of the St. Regis–Honeywell Tester".

Jappe Assembles Nonwovens Program for Plastics–Paper Conf.

N. A. Jappe, Program Chairman for the two days of panels and technical papers on nonwovens that are part of the

program for the 26th Plastics–Paper Conference in Chicago this September, has reported good progress in assembling an outstanding group of speakers for the event. A TAPPI member since 1945, he is an officer of the *ad hoc* committee on nonwovens, and has had papers published in *Tappi*.

Dr. Jappe received a chemical engineering degree in 1945 from the University of Washington, and the M.S. and Ph.D. degrees from The Institute of Paper Chemistry in 1956. He is a Registered Professional Engineer in Wisconsin. His industrial career includes 7 years with Scott Paper Co. at Anacortes, then 4 years as Technical Director of the W. R. Grace bagasse paper mill in Peru, and the past 17 years with Scott again, where he is now project manager, paper research.

The Plastics–Paper Conference is being held at the Sheraton-Chicago Hotel on Sept. 13–15. Besides the nonwovens sessions, there will be sessions devoted to extrusion coating, hot melts, plastics, and plastic laminates. At the conclusion of the conference, two short courses will be given simultaneously, one on extrusion coating, the other on PVDC coating resins.

For further information on this conference see p. 287 of this issue.

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Future of Secondary Fibers Highlighted

"From rags to riches" and the need for developing new products made from recycled paper fibers are among the subjects to be discussed at the TAPPI 4th Secondary Fiber Pulping Conference in September, along with more specialized topics such as the design of screens to recover fibers at pulp mills for recycling, and limitations of the cylinder and fourdrinier machines in using secondary (waste) fibers. The conference, whose theme is "Secondary Fibers and the Future," will be held Sept. 15–17 at the Jack Tar Hotel, San Francisco, Calif.

R. W. Barton, Virginia Chemicals Industry, West Norfolk, Va., is the general chairman. He invites nonmembers as well as members to attend and register for all events. There is no advance registration.

About 11 million of the 58 million tons of U. S. paper and paperboard annual production and imports are recycled to mills for treatment and eventual re-use in an ever-increasing variety of paper products, mostly boxboard containers and corrugated boxes, but also for newsprint, tissues, writing paper, and even toys and furniture.

According to the Program Co-Chairmen J. J. Higgins, Packaging Corp. of America, Grand Rapids, Mich., and W. C. Martin, Garden State Paper Co., Garfield, N. J., the five-session program will feature some 30 of today's top technical authorities on secondary fibers.

The first session will deal with the "magnitude of the problem," and will view overall approaches to natural resources, collection problems, recycling, and end products. The other sessions will be devoted to limitations in re-use for such products as molded materials and coating raw stock; specific fiber recovery and use projects; and the contribution being made to industry progress by such allied groups as ink makers, plastics and adhesive producers, manufactures of chemical additives and corrugated boxes, and printers of books and magazines.

Plans are being completed by the Local Arrangements Chairman, G. A. Graham, Consolidated Fibers Co., Oakland, Calif., for tours of several mills in the San Francisco area that are operating up-to-date recycling facilities.

Those planning to attend the TAPPI Secondary Fiber Pulping Conference should write now to the Jack Tar Hotel for room reservations, being certain to mention TAPPI. Inquiries about the conference may be directed to H. O. Teeple, TAPPI, 360 Lexington Ave., New York, N. Y. 10017.

Program Being Developed for 1971 Coating Conference

The program committee for the TAPPI 22nd Coating Conference has begun regular meetings to consider papers offered for presentation at the technical sessions, and has already accepted several outstanding manuscripts. Subjects include a new method of improving water resistance of starch, enzyme conversion of starch, high rate drying of aqueous air knife coating, chemical beneficiation of kaolin, gloss of clay/starch coatings on lightweight publication paper, and influence of the base sheet upon print quality.

The conference will be held May 16–20 at the Concord Hotel, Kiamesha Lake, N. Y. An attendance of about 1000 mill engineers, scientists, marketing specialists, equipment and chemical suppliers, and purchasing agents is expected at the conference, which is open to nonmembers as well as members of TAPPI. Special bus service from New York City to the conference hotel will be available.

Hotel accommodations can be obtained only when pre-registering for the conference itself through TAPPI headquarters, says the General Chairman, F. B. Loppnow, Kimberly-Clark Corp., Kimberly, Wis., who urges those interested in attending to write now for information to R. J. Mann, TAPPI, 360 Lexington Ave., New York, N. Y. 10017.

"Coating Preparation—Now and in the Future" is the conference theme, and many of the papers will be keyed to that subject. The technical program will occupy three full days: Monday through Wednesday, May 17–19, and will consist of between 20 and 25 papers. Committee meetings start Sunday and continue through the week. Plans for plant tours and a full ladies' program are now being completed by Local Arrangements Chairman J. A. Perry, H. B. Fuller Co., St. Paul, Minn. The schedule also includes the official luncheon on Tuesday.

One of the most interesting of the accepted papers is that on interaction of latex and clay in starch/latex bound pigmented coatings, by L. Mylnar and R. W. McNamee, Jr., of Rohm & Haas Co., who describe a new method to improve the water resistance of starch. The method depends upon a cross-linking mechanism between polymeric material and clay, producing a strong water resistant network that can tolerate high starch levels. Data from printing trials will be given by the authors to illustrate potential application to the manufacture of high quality offset papers.

A paper by A. F. Kaliski of Engelhard Minerals & Chemicals Corp., Inc., will report on the gloss of lightweight publication paper, unfinished supercalendered and brush-finished, as investigated over a range of coating weights and binder-volume fractions for coating systems composed of No. 1, No. 2, and MD clays and starch.

Little attention has been directed to the influence of chemical beneficiation upon kaolin, according to W. M. Bundy and H. H. Murray of Georgia Kaolin Co., who will discuss chemical influences on the rheology and coating properties of kaolin, as contrasted with the traditional relating of the functional properties to genetic characteristics. They will discuss beneficiation procedures, the subsequent changes in rheology, packing characteristics, and paper coating properties.

J. Shelendich of 3M Co. will describe experimental work with a new high rate drying process—up to 20 lb/hr/^{2}—for air knife coated paper. The process combines high velocity air impingement with simultaneous application of vacuum to the opposite side of the coated web. While the vacuum drying does not generally increase drying rate, it has various advantages, such as control of penetration and binder migration.

A detailed report on a laboratory study of process variables in enzyme conversion of starch will be given by W. D. Oleson of Consolidated Papers, Inc., who found that the important parameters are enzyme dosage and total coast time at given coast temperatures, and that their adjustment controls starch paste and resulting paper properties.

M. H. Voelker, also of Consolidated Papers, will describe recent work on control of print quality through adjustment of the base sheet.

There are still openings on the program for several outstanding papers, according to Conference Program Chairman F. R. Marchetti, who invites interested authors to write him at Titanium Pigment Corp., P.O. Box 600, Hightstown, N.J. 08520.

Alkaline Pulping Conference to Include Allied Processes

The scope of the 25th Alkaline Pulping Conference this year is being widened, following the precedent set by the technical program at the 1970 conference, to include papers supplied by five TAPPI committees with related interests. The five are alkaline pulping, sul-

Continues on next page

fite pulping, pulp bleaching, woodyard and woodroom operations, and nonwood plant fibers.

The conference will be held Oct. 25–28 at the Rice Hotel, Houston, Tex. The General Chairman is R. B. Kesler of O'Meara Co., Inc., who also headed last year's highly successful meeting. He invites nonmembers as well as members to attend and register for all events. There is no advance registration.

Authors who wish to propose papers for presentation should write to Mr. Kesler at the O'Meara Co., Inc., 647 Virginia St. West, Milwaukee, Wis. 53204.

Those planning to attend the conference can write directly to the Rice Hotel for room reservations, being certain to mention TAPPI. General inquiries should be sent to H. O. Teeple, TAPPI, 360 Lexington Ave., New York, N. Y. 10017.

1971 Plastics–Paper Conference in Chicago

Nine technical sessions, including two full days of panels and papers on nonwovens, are being planned for the 26th annual Plastics–Paper Conference to be held Sept. 13–15, at the Sheraton-Chicago Hotel, Chicago, Ill.

The theme of the conference is "Industry Responsibility," and at least one paper in each session will focus on that subject, according to the General Chairman A. R. Hurst, ARHCO Inc., West Chicago, Ill.

Two special short courses—one on extrusion coating, the other on PVDC (polyvinylidene chloride) coating resins—will be held simultaneously, beginning Wed. evening, Sept. 15, at the conclusion of the conference technical program, and continuing to Friday noon. The PVDC course is being offered for the first time; the extrusion coating course was initiated several years ago and has been highly successful. Registration for the courses is separate from that for the Plastics–Paper Conference.

C. C. Goodwin, Riegel Paper Corp., Flemington, N. J., is the program chairman and is now reviewing papers for the nine sessions, which will be devoted to extrusion coating, hot melts, nonwovens, plastics, and plastic laminates. The conference program also includes a ladies' program, being arranged by Mrs. A. R. Hurst.

Those planning to attend the conference or to register for one of the short courses, whether they are a member of TAPPI or a nonmember, can obtain further information by writing to M. J. Williams, TAPPI, 360 Lexington Ave., New York, N. Y. 10017.

Corrugated Container Conference To Be Held in the Fall

The 23rd Corrugated Containers Conference at the Sheraton Peabody Hotel, Memphis, Tenn., will be held on Oct. 12–15. It will be the second of two TAPPI corrugated conferences for 1971; the first has been announced for May 4–6 in Beverly Hills, Calif. This follows the successful pattern set last year, when it was found that the rapid growth of the corrugated industry, combined with a surge in new technical advances, had led to a need by engineering research, production, and marketing people for more than one national meeting per year.

The theme of the October conference is "What's New? The Conference Chairman, A. Richardson, Crown Zellerbach Corp., San Francisco, Calif., reminds industry people that registration for all TAPPI conferences is open to nonmembers of TAPPI as well as members.

Those planning to attend the 23rd Corrugated Containers Conference should write directly to the Sheraton Peabody Hotel for room reservations, being certain to mention TAPPI.

Interoffice Correspondence 3M COMPANY

cc: J. P. Ryan TCA-675
T. F. Bolles 209-1N
I. M. Grotenhuis 209-1N
H. A. Hedke 236-B
J. J. Keers 236-B
R. J. Kunz 236-B
T. W. Lindsay 236-B
R. W. Christiansen 236-B
B. E. Frank 53-4
P. H. Carey 53-4
A. W. Boese 53-4

Subject: MARCH REPORT

APRIL 27, 1971

TO: J. J. REICHERT 236-B

FROM: D. M. YENNI 236-B

The month of March was spent furthering the development of wiping fabrics for use on our Models 515, 520, and 522 Web Cleaning Devices.

The most satisfactory fabric thus far is a non-woven mixture of 60% polypropylene and 40% (by weight) cellulose acetate with about 30% HA-8 acrylic binder (by weight) as produced on the Rando Weber. The fibers of both materials are 1-1/2 inches in length and 1.8 dpf (Herculon Polypropylene T-101) and 2.0 dpf (Cellulose Acetate RM 6010). Bert Frank, Al Boese, and Pat Carey made a pilot plant run of this fiber mixture in Bldg. 219. The fiber produced was slit and is now being field tested in several places on 515 and 520 units.

In spite of some production problems the results have been quite encouraging. For instance, resin foamed, the fibers stuck to the rubber roll, repeated recycling of the fibers thru the Rando chopped them up too much, and the resin did not appear to flow uniformly throughout the web.

A brief summary of the field test results appears in Table III. No adhesive transfer or fiber dropout has been noted to date and it cleans at least as well as the Pellon material (described following). Subsequent experimental fabric runs at Building 219 and at Fairmont are now being set up.

A fiber procured from Pellon Corp. (designated #301) has been examined in this stead and found generally superior to any other material we have available in bulk at this time.

Central Research has not completed their characterization of this fabric but basically it appears to be an Ethyl Acrylate, possibly

containing a urethane. This spun bonded material seems to be held together with an acryl ic resin which is slightly less harsh than HA - 16 as opposed to the softer HA - 8 used in our fibers. A thousand yards (63 inch width) of this material has been ordered to supply us with 500 sets of fabric for our Model 515 units (while awaiting our own material) and another 500 sets for use on the Model 520 units.

Joe Reichert, Tom Lindsay, and myself met with Hank Powell and Leo VanBeaver of the Pellon Corp. to discuss fiber characteristics and what we might expect in the line of Q.C. on their part. The #301 material is apparently imported directly from Weinheim, Germany and resold as is. The web can, however, be treated here by some process they did not care to divulge, resulting in a slightly softer, more pliable fabric. Small samples of this treated fabric were tested by us in the laboratory and compared with the standard green acetate viscose fabric used now on the 522.

The results are shown in Table I.

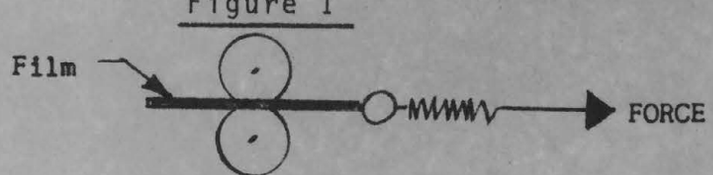
The loft calculation was made by determing the thickness of the fabric under a pressure of $10 g/cc^2$ and its decrease in thickness under a pressure of $50 g/cc^2$.

A length of each type of fabric was examined for thickness variations and standard deviations were computed. These results also appear in Table I.

The properties given in this table have been chosen as generally representative of those necessary to relatively describe given materials. On this basis the Pellon material seems to be superior to the green (acetate viscose). The blue (cellulose acetate-polypropylene mixture) with HA-12 binder seemed a bit harsh. The HA-8 binder is favored. Of the small samples of treated Pellon fabric given us by Mr. Powell the most intriguing thus far is that denoted "L". Larger samples of both the "L" (laundered) and "C" (steamed and calendared) fabrics are on the way for more complete testing. This entire program is, as mentioned, paralleling our own fabric development to insure that we will have some fabric available for use on those machines now in the field.

In order to determine the effects that web splices and the aforementioned cleaning fabric non-uniformities in thickness are having on the smooth operation of the Model 520 Film Cleaners the roll depression vs. load characteristics of a standard 520 unit in operation were examined. The results are given in Table II. The total roll depressions, given the force necessary to pull the sample 35 mm, 4 mil film between the nips (see figure I) may be estimated from the emp irical relation:

Figure I



Pulling force (lb) x 10 = Depression in mils

The preset force required to pull the film through each unit is set presently at 80 grams. This results in about a .5 lb. normal force on the rollers and total roll interference of 1.0 mil. As shown in Graph I the Pellon material under these circumstances is compressed to about 66% of its free thickness. This is the point at which the "spring constant" of the material becomes non-linear and any further de crease in fabric thickness will result in an increasingly larger film removal force. From Graph I and Table II the prese t roller distances and film tolerances may be easily specified. Similar data for our newer fabrics will be supplied on request.

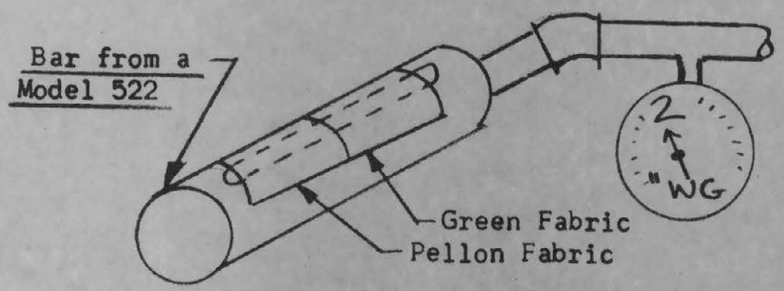


Figure II

A polyester film was run at 500 fpm across a standard 522 bar. half covered with Green fabric and half covered with Pellon #301 material. A vacuum of 2" of H_2O was held within the slotted tube as shown in Figure II.

A few very small flakes of waht appeared to be binder material dropped from the Pellon fabric at its edges when a web splice passed. Otherwise no fiber dropout was noted.

The green fabric released many short curled fibers along the test web, but like the Pellon did not appear to transfer adhesive.

MODEL 210 FOR FOOT USE

Ten one foot long Model 210 source strips screened onto their aluminum backings with Poly 880 have been received from Ed Heil for examination and comparison to source strips using Formvar or 2216 A/B epoxy as binding agents. The bars will be tested as to the effects of humidity, heat, shocks, some solvent vapors, source efficiency and time.

D M Yenni

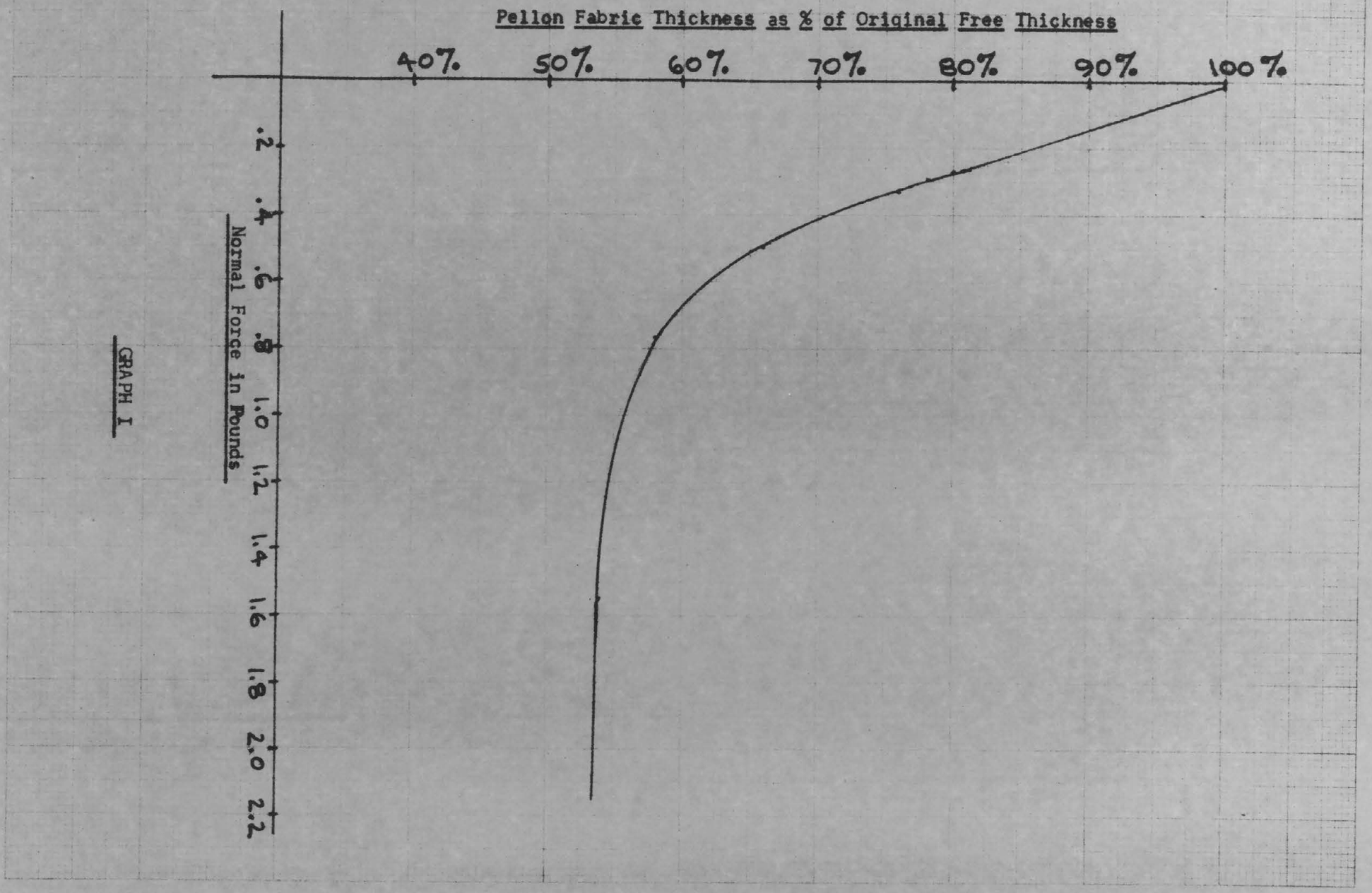
D. M. Yenni

5/7/71

TABLE I

Fiber	Loft %	Adhesive Transfer Rate	Particle Retention g/m	Scratch Rating (test samples scratched out of 12)	Thickness (mils) 95%	Standard Deviation (mils)	Tensile Limit (lbs)	Elongation at failure (%)	Resi Type
Pellon 301	21%	None	250	2	16.0-21.4	1.365	7.50	70%	Betwe HA-16 and HA-12 (Mediu
Green	17%	None More apt to trans-fer than Pellon	131	2	7.3-8.9	.386	2.70	14%	HA-8 Very soft
Pellon C	6%	None	295	0	13.0 - 16.6	.91	4.15	75%	Same 30
Pellon L	30%	None	156	0	8.8 - 10.7	.478	2.22	68%	Same 301
Blue 60-40 HA-12 Bin-der	6%	None	360	0	18.9 - 22.7	.950	3.90	39%	HA-1 Mediu

Pellon #301 - Untreated Pellon fabric direct from Germany
Pellon C - Pellon #301 steamed and calendered
Pellon L - Pellon #301 laundered


Pellon Fabric Thickness as % of Original Free Thickness
40%
50%
60%
70%
80%
90%
100%
.2
.4
.6
.8
1.0
1.2
1.4
1.6
1.8
2.0
2.2
Normal Force in Pounds

GRAPH I

TABLE II

NORMAL FORCE (lb)	FORCE TO PULL OUT 35 mm FILM STANDARD (lb)	RESULTING INTERFERENCE (mils)
0	0	0
.20	.08	0.8
.40	.16	1.6
.60	.23	2.4
.80	.32	3.2
1.00	.41	4.0
1.20	.49	5.2
1.40	.57	6.0
1.60	.66	6.8
1.80	.74	7.6
2.00	.83	8.4
2.20	.93	9.2

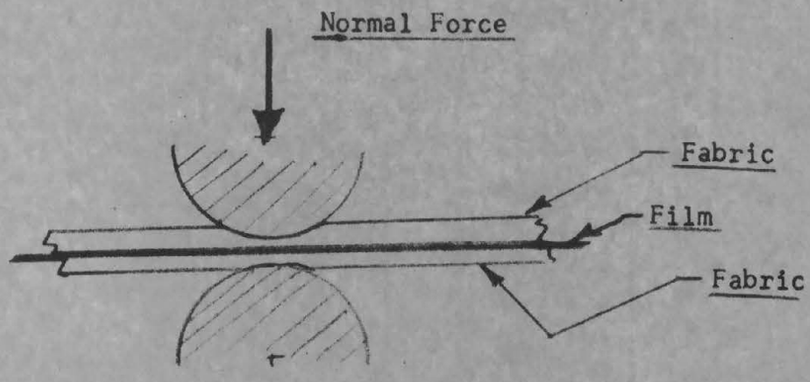


Figure III

Location	Fabric	Date	Users
Audio Visual Color Lab - Bldg 216 (Model 515)	Pellon 301	3-1-71	No problems, cleans perfectly.
	Blue 60% polypropy- 40% acetate. 30% Ha-8 Binder	3-16-71	Does as good a job as other material (301)
		3-25-71	No fiber drop off noted as yet.
		4-18-71	Working fine, no problems
Audio Visual Lab Bldg 216 (Model 515)	515W	2-25-71	Works fine, negligible lint removal problems. no adhesive transfer
	Pellon 301	3-1-71	Questionable cleaning ability relative to 515W. Does not take off dirt as well.
	Pellon 301 (2 scrims)	3-2-71	Does not clean as well as 515W. Too harsh.
	515W (old original run)	3-3-71	Works very well.
	60% polypro- 40% acetate 30% HA-8 Binder	3-4-71	Works very well, no problems.
	Pilot plant run	3-16-71	Works fine, no problem
		4-12-71	No lint removal, no adhesive transfer.
Mando Photo Co. (Model 520)	Pellon 301	3-1-71	Very good results, no adhesive transfer or lint dropout.
	60% Polypro- 40% acetate 30% HA-8 binder	3-15-71	Cleans as well as other fabric (Pellon) but too thick; film splices cannot go thru.
	Pellon 301	3-15-71	Doing very good job, no problems yet.
		4-14-71	No problems, works ver well.
Supra Color (Model 520)	Pellon 301	3-1-71	Good,no problems yet.
	60% Polypro 40% acetate 80% HA-8 Binder	3-15-71	Good no undesirable symptoms, no fiber dropout or adhesive transfer.
	Pellon #301	3-15-71	Good no problems
		4-14-71	No problems, works well

Interoffice Correspondence 3M COMPANY

cc: A. W. Boese - ~~219-1~~ 53-5
P. G. Cheney - 219-1
P. E. Hansen - 218-3
T. A. Hauger - 230-2S
R. P. Hoff - 230-2S
R. R. Kollitz - 42-4E
W. L. Lundsgaard - 42-4E
G. A. Norsted - 42-4E
B. R. Potjer - 42-1W
B. G. Schneider - 42-1W
H. B. Walden - 230-B

Subject: Floatation Of Saturated Nonwoven Webs, Bldg. 219

May 21, 1971

3/16/72

PROGRESS REPORT

A second run was made on the Rando-webber in Building 219 on March 29 and 30, 1971 to determine the feasibility of transporting a saturated nonwoven web using three 30-inch Overly's AIRFOIL web stabilizers. The initial run in February indicated that exhausting the air between each AIRFOIL was essential to obtain web stability. Exhaust ducts were made for this experiment.

CONCLUSIONS:

1) Stability in transporting a saturated nonwoven web was achieved when the proper exhaust was used between the AIRFOILS.

2) Some minimum tension is necessary to maintain stability.

3) The AIRFOILS operated the best at about 0.5" w.g. static pressure. Higher pressure can be used effectively for films or nonwoven webs laminated to film as for Disposable Drapes.

DISCUSSION:

The experiment was set up with the AIRFOILS set at about 14" on center, based on the last run. The attached sketches show the setup used. The air handling system was first set up such that the exhaust air equalled the supply air. This did not provide the necessary balance. Stability was not achieved until the exhaust air exceeded the supply. The exact amount could not be measured, but it was estimated the ratio should be 2:1. It was felt that, because the completed system was open to the room excess exhaust air was necessary because of entrained room air. The AIRFOILS did get fouled with saturating solution that was difficult to remove. Provisions must be made for cleaning.

Since running these experiments, we learned from Mr. A. J. Hansen of Overly, Inc., that a study made by Dr. W. E. Steward of the U. of Wisconsin indicated that an AIRFOIL with a 4.5 inch surface and 48 mil slot is theroretically the best for heat transfer. Overlys is now making a standard 4 inch AIRFOIL with a 60 mil slot. The larger slot is used to minimize plugging.

SKETCH 1

This sketch shows the web in a steady state stable condition. The exhaust ducts were taped, as shown in the bottom of the sketch, to provide a uniform suction across the duct. The AIRFOILS were located 2" above the carrier screen. The arrows indicate air flow direction from the foils. The web has a slight tendency to lift immediately after the foil but to prevent further lifting, a small amount of tension was applied. The web lost about 1/2" in width (from about 24 to 23.5). Note that the web followed the bottom saturating roll for about 2 inches. If greater distances were allowed, uneven release across the width of the bottom saturating roll causes some unstable conditions due to low tension. If the web comes directly out of the nip, the web loses about 2 to 3 inches in width due to too much tension. Tension measurements were not made.

The last AIRFOIL surface lifting area was extended by attaching a piece of Dexion as shown. A greater lifting area was expected to provide good stable conditions with lower static pressures, but conclusive evidence could not be obtained due to the improper curvature of the added surface.

During the first run, without exhaust, the static pressure necessary for good lifting was about 1.5 to 2 inches w.g. with first foil. Good lifting was achieved on this run with static pressures as low as 0.5 inches w.g. on all AIRFOILS.

SKETCH 2

This sketch examplifies an unstable web condition when the web tension is at or near zero. Note the additional wrap on the lower saturation roll. This promotes uneven release from the roll and causes bunching and lifting of the web after the first AIRFOIL. The web becomes so wrinkled and roped after the first foil that the second foil could not lift the web.

SKETCH 3

This sketch shows how one exhaust duct can be used to serve two AIRFOILS and still transport the web. Stability was maintained.

SKETCH 4

A film was laminated to the web to simulate Disposable Drapes. This was the easiest to transport. Greater tensions and greater static pressures in the AIRFOILS could be used. Exhaust air flow was found to be less critical and could be reduced.

Once the proper air flow settings were reached to achieve stability, this condition could be re-established when the air supply fan was stopped and then restarted.

SATURATED WEBS USED

1) 7 and 12 lbs./ream (dry fiber) STB type backing saturated with STB type solution.

2) A 12 lb. web laminated to 3/4 mil polyethene to simulate Disposable Drapes. Web speed throughout the experiment was about 20 FPM. Drying checks were not intended.

FUTURE WORK

Work to date was to demonstrate that AIRFOILS could be used to transport a nonwoven web without the use of a carrier belt. The next step is to use AIRFOILS to transport and dry a nonwoven web.

The Rando-webber located in Building 216 is the only Rando-webber that can be used that has the necessary support equipment to evaluate the complete drying and transporting experiment. The oven would require modifications to accommodate the AIRFOILS. A cost estimate is being made for purchase of the AIRFOILS.

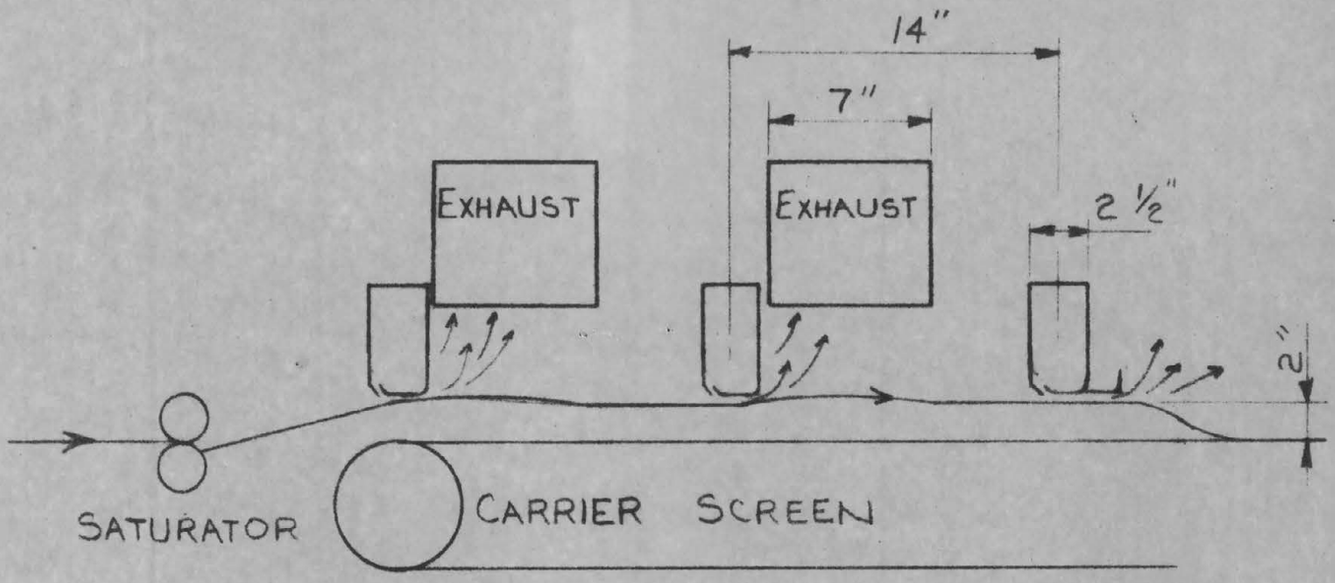
At this time no maker is in the design stage that will require the use of this system. It is felt that this is the time to obtain cost estimates for more complete experiments.

R. I. Bilski

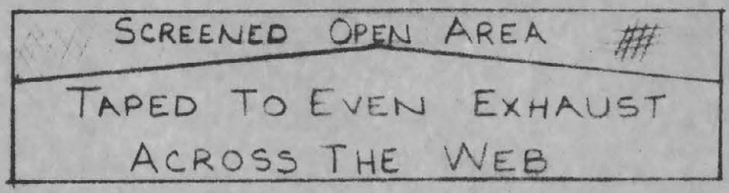
R. I. Bilski

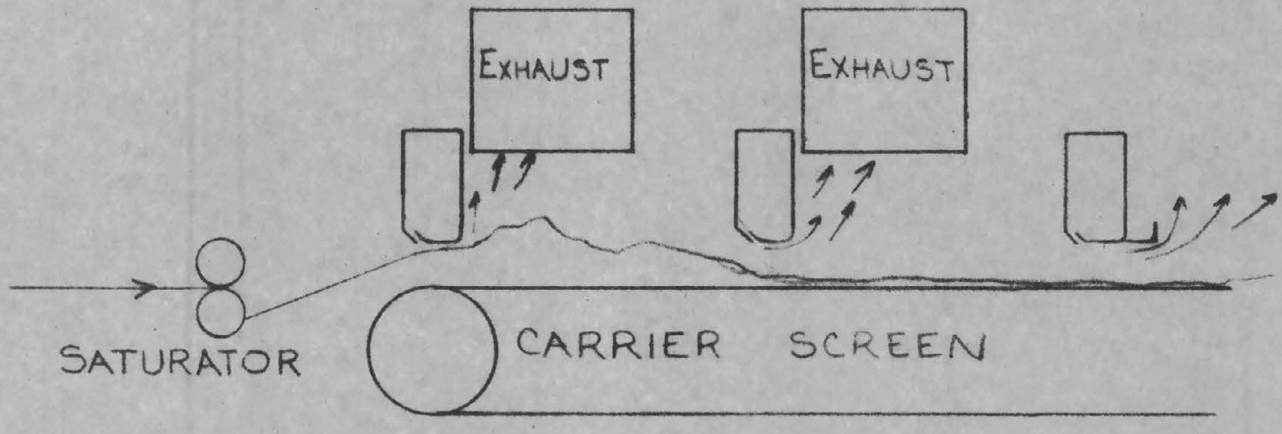
/ac

Attach.

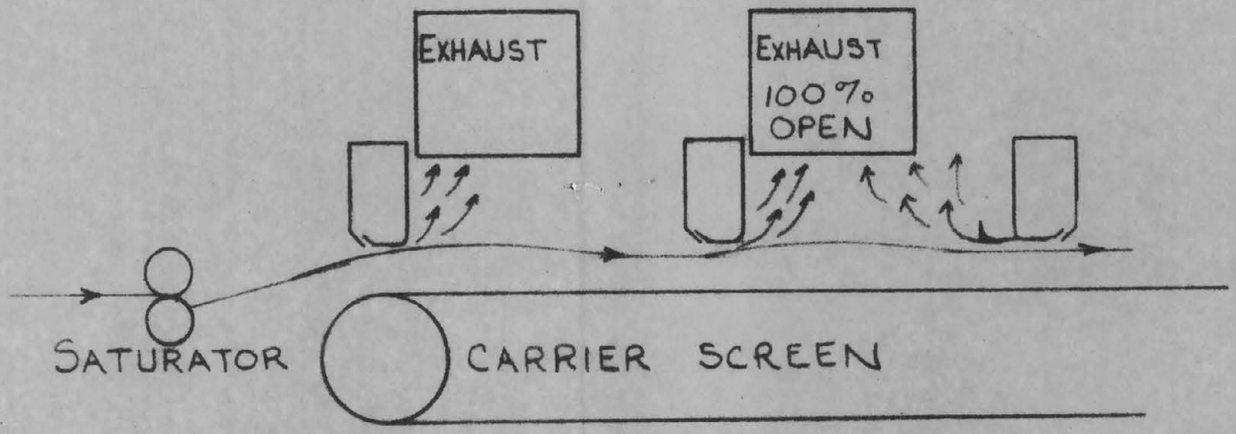


SKETCH # 1

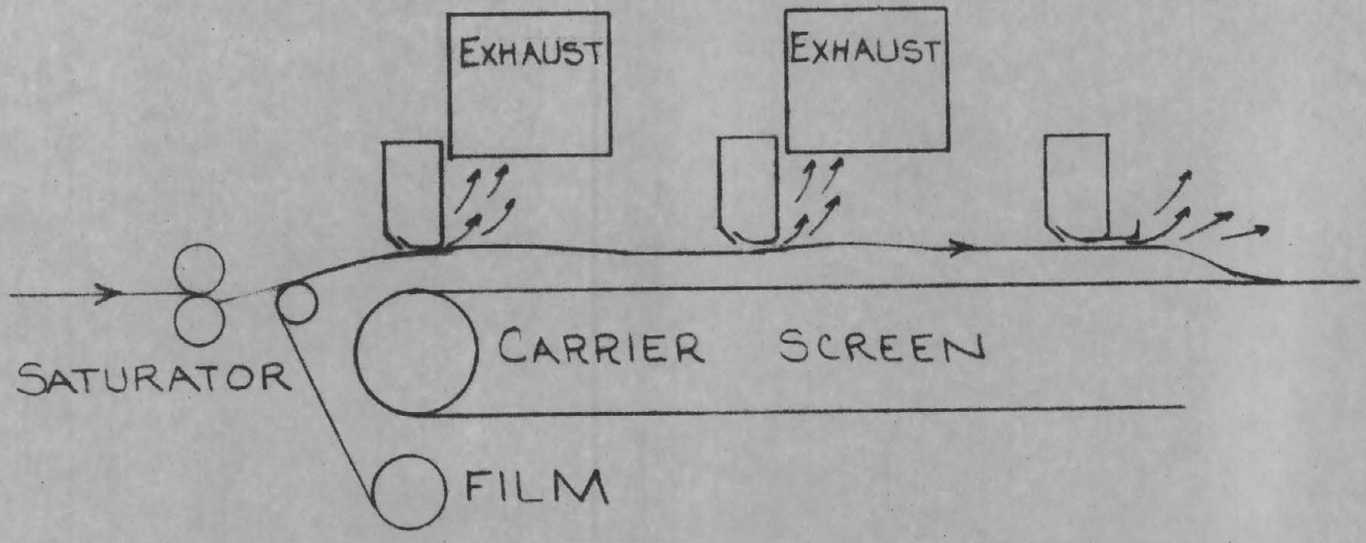




SKETCH # 2



SKETCH # 3



SKETCH # 4

Al Bare

Interoffice Correspondence 3M COMPANY

Subject: APRIL & MAY REPORT

JUNE 2, 1971

TO: J. J. REICHERT

FROM: D. M. YENNI

Bead Analysis

Our lab analysis of the samples of bead lot GB 270-2-669 (those being used presently in microsphere production) has been completed. The results of this examination were recorded in detail and the report is in typing. The data was compared to our Laboratory acceptance specification 15-1 and found to be acceptable with the exception of the nickel plated sample in which a large amount of less than 1.0u diamter particles were found free among the microspheres. This "powder" may be the result of some some of the plating operation and peculiar to this particular sample only. Another group of these nickel plated microspheres should be examined.

Fabric Development

Samples of various wiping materials were received from companies all over the country for our testing. The fabrics received are described in the ensuing paragraphs and the actual experimental data is summarized in Table I. The Pellon material, used presently, was examined with these samples to give us a basis for comparison of the results. None of those fabrics tested, however, were found to be as satisfactory as the Pellon material. Continued market scanning for a possible Pellon replacement is in progress.

Our own fabric development program is paralleling this search for outside vendors to temporarily supply our wiping fabric needs. The 60% polypropylene, 40% cellulose acetate fiber mixture has been chosen for ease of handling and wiping effectiveness. Several fabric runs in Building 219 have shown that a desireable fabric can be made up of this mixture with about a 10% by weight of HA-8 resin and a thickness of 20 mils. Increasing this resin content raised the particle retention but also caused resin transfer to occur. The Zytel resin seemed to make the web a bit stiff and decreased its particle retention. The 60% - 40% Polypro-Cellulose Acetate fiber mixture was easily wet in this resin using an alcohol base instead of water. Reasonable softness was achieved at the cost of a loss in fiber retention. A new web wetting device for use in line with the Rando Webber has been built and should help greatly in increasing the uniformity with which the fibers are wet regardless of the resin type.

MATERIAL	wt sample	wt after	1000 x diff. g/m^2	t^1 25g/m²	t^2 150g/m²		Loft %	Scratch No.	Adhesive transfer	tensil strength	Elongation	fiber los
Pellon	.0442	.2688	225	17.5	10.0	7.5	43%	0	No			25
Bx-24 K.Konklin	.0382	.1251	87	7.5	6,0	1.5	20%	0	No			100
BX-18 K.Konklin	.0441	.1554	111	9.5	7.0	2.5	28%	0	N0			200
Worksafe Cloth	.0848	.1565	72	9.5	8.0	1.5	16%	0	No			100
Kemi-Kleen-Yel	.0766	.4163	340	13.5	11.5	2.0	15%	0	Yes			50
Kemi-Kleen Blue	.0412	.1417	100	8.5	6.5	2.0	24%	0	Yes			25
Crown-Zellerbach	.0977	.1060	8	10.0	8.0	2.0	20%	0	No			50
Crown-Zellerbach	.0742	.0940	20	8.0	6.0	2.0	25%	0	No			100 fine
Chicopee Mill	.0244	.0388	14	5.0	4.5	.5	10%	0	No			100
Monsanto .6	.0212	.0241	3	3.5	2.5	1.0	29%	0	No			5 tiny
Monsanto 1.0	.0379	.1200	82	8.0	2.0	1.0	12%	0	N0			5 "
Monsanto 1.5	.0489	.0792	30	6.5	5.5	1.0	15%	0	No			2 "
Monsanto 2.0	.0598	.1141	5	11.0	10.0	1.0	9%	0	No			5 "
Webril R2201	.1137	.3626	240	34.5	27.0	7.5	22%	0	No			10,000
Webril R2401	.1057	.2126	107	35.0	27.0	8.0	23%	0	No			1,000
Webril R2601	.2033	.3384	135	48.0	43.0	5.0	10%	0	No			10,000
Webril R2801	.2524	.3833	131	64.0	59.0	5.0	8%	0	No			10,000
Webril R2901	.2804	.4070	127	71.0	63.5	7.5	11%	0	No			10,000
60-40% 15% HA-8	.0472	.1767	130	9.0	6.5	2.5	28%	0	Yes			25
60-40 Zytel 10%	.0488	.0815	33	10.0	8.5	1.5	15%	0	No			5
J-5 60-40 7.5%	.0968	.3253	230	29.0	23.0	6.0	21%	0	No			15
60-40 30% HA-8	.0506	.1951	145	13.0	10.0	3.0	23%	0	Yes			10
60-40 10% Zytel	.0338	.1264	93	12.0	9.5	2.5	21%	0	No			200 long
Green Ace.-Visc.			130	6.5	5.5	1.0	15%	0	Yes	2.7	14%	250
Polyester Backed Blue Cotton				7.0	6.0	1.0	14%					100,000
Polyester Syncel White				6	5.5	.5	8%					1,000
Scott Towels												500

TABLE I

Our initial run of blue fabric made in 219 is still being used in two Model 515 units installed in Audio Visual. The users are completely satisfied with the job being done by the units. In general, the thicker fabrics of this type are superior to Pellons particle retention, fiber loss and tensile strength characteristics. They are both equal as far as loft and scratching properties. One of our biggest problems now is in obtaining product uniformity.

SUMMARY OF SAMPLE WIPING FABRICS OBTAINED TO DATE

Applied Synthetic Corp. - Two samples were obtained both of polyester backed cotton fibers. The fabric looked like a fine flocked material much like typewriter erasing paper. Both samples had very little loft and were prone to release over 1000 times as many fibers as the Pellon fabric when subjected to the same test. This made them both unacceptable for our use.

Chicopee Mills Inc. Eight samples of towel type materials and one spun bonded nylon sample were obtained. Six of these materials were perforated and thus unacceptable. Two of the samples, however, the 234 Reticulon Industrial Wipes and #770 Masslin Heavy Duty towls, were rejected because of high fiber dropout and non-uniformities respectively. The Spunbond nylon material has unacceptably low loft and particle retention capabilities.

Crown-Zellerbach . Samples of some cellulose tissue bonded onto a spunbonded polypropylene web, one of which was treated with a 3M flouro carbon and the other untreated, were sent. Both samples exhibited very low particle retention, medium loft and fiber dropout on the order of two to three times that of Pellon. These samples were both rejected primarily because of their poor particle retention.

Kendall. Fifteen samples of various Webril R type fabrics were sent to us for testing. In all cases fairly good particle retention was noted and although they depressed about the same amount as Pellon under test, they were initially from two to four times as thick. They were all 100% cotton fiber with no resin. They were extremely low on tensil strength and exhibited unusually poor fiber retention properties. The single roll of Webril wipes sent to us had similar characteristics and all of these fibers were rejected primarily on the basis of their tensil and fiber retention ratings.

Lowndes Prod. Inc. (Locally: United Chemical & School Supply)

Two samples were sent, one of their untreated Kemi-Kleen material and one treated with a substance to aid in picking up dust. Bot samples had high particle retention, were of excellent texture and medium loft. They exhibited about the same fiber drop out as Pellon but a tendency towards adhesive transfer was noted. They were both rejected because of this latter property.

Monsanto. Eleven samples of their Cerex Spunbonded 100% Nylon monofilliament (6,6 Chemically bonded at the crossover points) material were received and tested. Low particle retention characterisitcs were noted in all cases, the best being about 1/3 that of Pellon. Low loft

caused rejection of these samples the best of which, however, was the 1.0 oz/yd² by weight.

Scott Paper Co. Two samples, #05353 and #05362 of hand towels with sealed edges were received by us for examination. The embossed surface and high fiber dropout rate caused us to reject the samples. The necessity of sealing all slit edges would add problems.

3M Purchasing. Ken Konklin sent three samples of wiping fabric. Two of them were embossed and had good particle retention, medium loft and from 4 to 8 times the fiber droput problems as Pellon. These samples were rejected, however, an increase in resin content might make them satisfactory. The third sample was a woven nylon wiping rag with low particle retention, low loft and high fiber dropout. It too was rejected.

210 Bar For Food Use

No further work has been done on this project. The test bars will be wiped and the drop tests will be continued as soon as possible, however.

D. M. Yenni

cc: J. P. Ryan
T. F. Bolles
I. M. Grotenhuis
H. A. Hedke
J. J. Keers
R. J. Kunz
T. W. Lindsay
R. W. Christiansen
B. E. Frank - 53-4
P. H. Carey - 53-4
A. W. Boese - 53-4

Form 6747-E

3M COMPANY TECHNICAL REPORT SUMMARY

DATE: July 1971

TO:
Technical Communications Center, 201-2S

Corporate Innovative LABORATORY, DEPT. NUMBER 0508

MICROFORM COPIES:
cc: D. D. Campbell
P. H. Carey
D. J. David
E. W. DeZiel
M. R. Hatfield
V. W. Marquart
J. R. Starkey

Title
Second Quarterly Report - 1971

Project:
908731 - 001 908802 - 001 908807 - 001

Project Number: | Report No: (3 digits)

To:
A. W. Boese

By:
Burton E. Frank

Employee Number:
12365

Objective:

Notebook Reference:

No. of pages including coversheet:

SECURITY
☒ Company Confidential(Open)
☐ Special Authorization(Closed)

IF SUMMARY REPORT
Has information in this report been covered by other reports submitted to TCC?
☐ No
☐ Partially
☐ Completely
Please keyword information not included in other reports and give page numbers of new material:
_____.

3M CHEMICAL REGISTRY
New chemicals reported?
☒ No ☐ Yes

KEYWORDS
Select general, specific, and 3M product terms from 3M Thesaurus. Enclose suggested terms in parentheses.

3M - NBVD
Non-woven
Quarterly
Fiber
Binder
Curing
Testing
Flameproofing
Drying
Laminating

ABSTRACT and Conclusions. (System can accommodate 200-250 words)

SPECIFIC PROBLEMS remaining to reach objective.

_____ Information Scientist Initials

Project 908731 - Non-Woven Products

1. Webs for Charcoal Aquarium Filters

Ed Perrault continues his work on filters. Again this quarter he called on us for webs, this time in the Medical molded mask formula, with 3 denier polyester. A group of webs were made up on the laboratory card and given to him for evaluation.

2. Webs for Synthetic Leather Group

Neil Loeding requested that we make up another series of carded webs for him of approximately 120 pound ream weight. The fibers to be used were 1.8 denier polypropylene, 3 denier polypropylene, and a blend of 1.5 denier polyester (70%) and 3.0 denier polypropylene (30%). We experienced no difficulties in making these heavy webs. They were stapled between layers of paper and picked up by Neil for testing.

3. Webs for Dayco Corporation

Mr. J. R. South, a District Manager for Dayco Corporation, called on us to ascertain if suitable non-wovens might be available to replace woven materials which not only were expensive, but also were not completely satisfactory for their use. He specified a material with the following properties:

1. 15 to 20 mils thick. Tensile strength - 50# per inch.
2. Soft, good drape.
3. Deflection - 7 mils at 125 P.S.I.
4. Heat Stability - 290°F for eight hours with 80% strength retention.
5. Binder to be gasoline and solvent resistant.
6. Fibers and/or colors not important.

We were unable to obtain all these properties in a single non-woven web. High modulus viscose webs, bonded with HA-8, HA-16, or TS-100, were of adequate strength and met the thickness specification. However, the resulting webs were rather stiff and could not meet the heat stability specification (because of the degradation of the viscose fibers). Acrylic webs, which were bonded with HA-8, could meet the heat stability specification. Also, they were soft, draped well, but were too thick and too low in tensile strength. Four webs, all of high modulus viscose, were given to Mr. South for evaluation.

4. Effect of Coallescent Agents on Web Properties

Four solutions were made up; a control and the lowest level of coallescent and wet-edge agents, in each binder (HA-8 and B-15). Four webs were padded with each of the four solutions, and a representative web was chosen from each group for testing. These initial tests were negative - the control samples showed better properties than the treated samples. This work will continue as time permits.

5. Vern Marquart's Synthetic Chamois

During the quarter, we did some color matching work on Vern's webs to obtain a shade as close as possible to commercial chamois skins. Then we padded a large group of needled samples with a mixed resin binder of the proper shade. Vern will report on these webs after he has completed his testing.

6. Acrylic Webs for High Temperature Work

Al Boese continued his high temperature work on acrylic webs. We made more webs for him, opening the fiber on the card and completing the 60# webs on the Rando. Also, we padded several groups of webs, and followed with Instron testing of many samples.

7. Vacuum Doffing

Three times during the quarter, Herb Walden modified the vacuum doffing system; and after each modification, we helped him install it on the laboratory card for trials. Now we have come to the conclusion that the system, as currently set up, is not capable of accomplishing the desired objectives (increasing both the "randomness" and the weight of output webs). No further work is planned on this project for the present.

8. Webs for Jerry Bankers

Jerry Bankers wants to design a relatively strong non-woven material which will selectively remove oils and greases from an admixture with water. Since it is known that blown polypropylene micro fibers will do this, we tried to card blown fibers, both in chunk form and in sheet form. No cohesive web could be produced from the card. Also, carding a mixture of micro fibers and polypropylene staple was unsuccessful. We did make a very interesting web from viscose and polypropylene staple. The viscose was opened first, and the block was cut into 1" strips. The polypropylene was handled in the same way. Then the strips were alternated on the card feed apron and run through the machine. This resulted in a striped web with good adhesion between the stripes. Jerry wants to do more work on this project next quarter.

9. Webs to Reinforce Foam

Vince Chelstrom, of Industrial Tape, wants to try using a non-woven to reinforce a foam tape. The construction would have a non-woven core, foam on either side of the core, an adhesive on the foam surfaces, and paper liners on the adhesive layers. I gave him several 7" x 18" webs to try on a laboratory (or pilot) scale run. He will report back after the run is made.

10. Medical Products Work

One pound of a Japanese viscose fiber (1.5 denier, 38 mm.) was sent to Jerry Gierok for evaluation, and he brought the fiber to us. For our initial work, we used the

laboratory card. Three control fibers were compared to the Japanese fiber; regular 1.5 x 1-9/16" viscose (RM 6230), 1.5 x 3/4" viscose, and cut viscose tow from Hutchinson. Only the cut tow could not be handled on the card. (It dropped out of the machine, flew all over the room, and did not give a cohesive web.) Although the Japanese fiber was very tangled, it gave a satisfactory web. Later we will run these fibers on the laboratory Rando, after a preliminary opening on one section of the Building 219 K.D.

Project 908802 - Service to Nuclear Products

11. Fairmont Runs

Two special runs were made at Fairmont to obtain materials for upcoming pilot runs at Building 219. On the first run we made a heat bonded web on the 14-2 Rando for subsequent saturation in 219. Starting fiber was the regular 60-40 polypro-acetate blend. The use of a film liner (Mylar) was found to be necessary to obtain a satisfactory bond on the material. The second run was to mix and open more of the same fiber blend on the breaker section of the garnett (60% polypropylene - 40% cellulose acetate). About 100 pounds of the blend were prepared.

12. Dusting Fabric Runs - Building 219 Rando

Three pilot scale runs were made on the Rando in Building 219. The first run was not successful. We were trying a Teflon covered roller on top and a steel knurled roller on the bottom in the padding station. Using HA-8 as the binder and the fibers blended at Fairmont, we were unable to get either good saturation or satisfactory web release. Run 2 was made using the heat-bonded web from the Fairmont 14-2 Rando. On this run, our problems were poor web saturation and fuzzy web surfaces. Toward the end of the run we tried a Zytel-methanol solution as binder. This gave good saturation, and a relatively lofty, soft web. For the third run, we used Zytel-methanol solutions and again made the web from fibers blended at Fairmont (the 60-40 mix described previously). Using a release-paper liner, we obtained a lofty web with a soft upper surface and a shiny, smooth lower surface. This, we felt, was the best material we have made to date for dusting fabric. Unfortunately, the web formation from the Rando was marginal.

13. Laboratory Rando Webs for Filter Fabric

Two groups of webs were made on the laboratory Rando using the 60-40 blend from Fairmont. The webs were padded with 20% HA-8 and then dried, cured and trimmed for Pat's silvering experiments.

Project 908807 - Service to Gift Wrap

14. Molding Thermoplastic Face Masks

Chas. Brix and Russ Clayton are working on a project to produce masks from some blend of fibers which is sufficiently thermoplastic to be heat molded and will

result in a material that is stiff enough so that no resin treatment afterwards is required. Several advantages would be realized, among them the elimination of the saturating station and the drying oven. Also, the fiber between the masks could be reclaimed. We have made up several groups of webs for them to try on their vacuum former. In all cases, we have opened the fiber on the card and run the webs on the Rando. This work will be continued next quarter.

Burton E. Frank

Burton E. Frank

BEF/rh

Form 6747-E

3M COMPANY TECHNICAL REPORT SUMMARY

DATE: July, 1971

TO:
Technical Communications Center, 201-2S

Corporate Innovative LABORATORY, DEPT. NUMBER 0508

MICROFORM COPIES:

Title: Second Quarterly Report - 1971

Project:

Project Number: 908731

Report N (3 digits) 002

To: A. W. Boese

By: Vernon W. Marquart

Employee Number:

Objective:

Notebook Reference:

No. of pages including covershe

SECURITY

[X] Company Confidential(Open)
[ ] Special Authorization(Closed)

IF SUMMARY REPORT

Has information in this report been covered by other reports submitted to TCC?

[ ] No
[ ] Partially
[ ] Completely

Please keyword information not included in other reports and give page numbers of new material:

_____.

3M CHEMICAL REGISTRY

New chemicals reported?

[X] No [ ] Yes

KEYWORDS

Select general, specific, and 3M product terms from 3M Thesaurus. Enclose suggested terms in parentheses.

3M - NBVD
Non-woven
Quarterly
Fiber
Binder
Curing
Testing
Flameproofing
Drying
Laminating

ABSTRACT and Conclusions. (System can accommodate 200-250 words)

SPECIFIC PROBLEMS remaining to reach objective.

_____ Information Scientist Initials

A synthetic chamois skin, wiping cloth, a web that might be used as a controlled or regulated means of watering and liquid fertilizing plants.

On May 10, 1971, I took eleven blends of webs I made on the 12" Rando over to Building 219-1 to needle on the James Hunter needle loom machine.

After webs were needled, I put webs one at a time in the oven to shrink to make webs stronger before and after saturation. After shrinking webs, they were then saturated with two different Hycar latex. I let webs dry, then cured in oven.

Evaluation of the above experiment:

I gave the janitor from Building 53 some of the above material to try out when washing his car. He used it eight times. When he gave me back the material, it was still good but for two 1/2" tears in it. Tears were put in web by catching on the car trim in the last usage. He said he liked the web better because it did not tend to catch on the trim as much as a sponge and had more flexibility.

Web was also used as a dish rag and wiping cloth for two months before tearing.

A Double Screen Saturator for Non-Woven Webs

Pat Carey came up with a good idea on how to saturate non-woven webs. He had the frame made up, and I had Dan Bishop of New Business Ventures make up all the rolls I needed to put a screen saturator together with.

The first type of screen we tried was window screen. With the hardness of the nip rolls we have, the nip rolls will not squeeze the screen into the nip rolls. Result: Too much pick up and not a good release from screen.

We have tried nylon scrim and glass scrim also. What we need is a screen with good release after coming out of the nip rolls and to control the binder pick up.

Don Yenni is going to make us two soft rubber nip rolls to try. We are also going to try a fabric we had sent to us by A. J. Harmon, Manager, Marketing Services, Formex Company.

The advantage of having a screen saturator over a nip saturator is that you get much better saturation, and positive control of the web is maintained at all times. Web distortion is eliminated.

More testing of screens and nip rolls will be done.

Non-woven webs made on 12" Rando web for Mr. John Kistner of Central Research, Building 201.

As requested by John Kistner, Al Boese and Vern Marquart made some blended webs with Vermiculite in them to be saturated with John Kistner's Hydrophilic polymers.

He will run some experiments with the above webs we made for the use of stopping water leakage.

Vernon W. Marquart

VWM/rh

Form 6747-9

TO:
Technical Communications Center, 201-2S

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3M COMPANY TECHNICAL REPORT SUMMARY

DATE: August, 1971

CENTRAL RESEARCH LABORATORIES
CHEMICAL RESEARCH LABORATORY, DEPT. NUMBER 0517

Title
Second Quarter Report, 1971 - Organic

Project: Hydrophilic Polymers	**Project Number:** 764200 / **Report No: (3 digits)** 013
To: T.J. Brice	
By: J.F. Kistner	**Employee Number:** 009454
Objective: To explore hydrophilic polymers and to develop new applications for them.	**Notebook Reference:** 32246-7; 31485-12,13,31; 30277-27-36
	No. of pages including coversheet: 16

SECURITY
- [X] Company Confidential(Open)
- [ ] Special Authorization(Closed)

IF SUMMARY REPORT
Has information in this report been covered by other reports submitted to TCC?
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- [ ] Completely

Please keyword information not included in other reports and give page numbers of new material:

3M CHEMICAL REGISTRY
New chemicals reported?
- [ ] No
- [X] Yes

KEYWORDS
Select general, specific, and 3M product terms from 3M Thesaurus. Enclose suggested terms in parentheses.

CENTRAL-RESEARCH
CHEMICAL-RESEARCH-LAB
QUARTERLY
GEL
HYDROPHILIC
DI/ISOCYANATE
ADHESION
AGING
ANTIOXIDANT
CARBAMIC/ESTER
CONCRETE
WEB
VERMICULITE
NON-WOVEN
PRIMER

JWV Information Scientist Initials

ABSTRACT and Conclusions. (System can accommodate 200-250 words)

An economical method for the purification of anhydrous 2-hydroxyethyl carbamate has been developed.

It has been shown that pure 2-hydroxyethyl carbamate is stable at room temperature.

Hydrophilic isocyanates have been surveyed as concrete primers.

A new impregnated web has been designed for leak prevention.

A new compound, to serve as a substantive hydrophilic handcream, has been synthesized.

Antioxidants, such as sodium sulfite, will prevent hydrogels from browning with age.

SPECIFIC PROBLEMS remaining to reach objective.

Project History

This project was initiated in November, 1969.

Patent Status

A patent proposal describing webs and other substrates impregnated with water-reactive prepolymers for the damming of leaks is being prepared by G.M. Rambosek of NBVD. In this connection, R.I. # 3247, entitled,"Impregnated Materials for Damming and Leak Prevention" has been written.

A patent proposal, X-1392, entitled, "Hydrophilic Cushion Material" has been written by W.O. Ney and is presently being readied by Patent Counsel for filing in the near future.

Related Work

B.F. Tungseth and L.J. Skriba of NBVD are exploring the use of isocyanate-endcapped prepolymers as water curable sealants. They are also modifying the prepolymers with additives to improve performance, and are active in the marketing aspects of hydrophilic sealants.

C.D. Wright, E.W. Janssen, L.M. Howell, and R.J. Peffer of AC&S are developing a hydrophilic insole for shoes, as well as investigating the application of the hydrophilic isocyanates in greenhouses, and as a root protector on tree farms.

E.R. Harrell, R.F. Fulton, and G.F. Schumacker of AC&S are evaluating some hydrophilic isocyanates as primers for better adhesion of Bioban on wet concrete.

J.H. Prager and R.Y. Wen of Central Research are exploring hydrophilic isocyanates in substantive, drug-containing formulations.

E.L. Baratto and P.A. Rother of the Abrasives Division are testing hydrophilic isocyanates as coatings on sanded concrete blocks. The coatings not only beautify the blocks by highlighting the aggregate in the sanded faces, but also waterproof the very porous concrete against water flow. Yellowing upon exposure to sunlight is presently a drawback of the polymer.

H.J. Revoir, C.A. Sterling, W.L. Paciorek, and L.G. Gehlhoff of Commercial Tape are evaluating new compounds designed to serve as substantive hydrophilic handcreams. Results thus far have been very encouraging, with substantivity having been demonstrated.

Summary of Current Progress

A simple, economical method for purifying 2-hydroxyethyl carbamate has been found.

Excellent stability of the pure anhydrous 2-hydroxyethyl carbamate at room temperature has been demonstrated.

Certain hydrophilic isocyanates show great promise as concrete primers.

A patent proposal (NBVD-137), entitled, "Impregnated Materials for Damming and Leak Prevention" has been written by G.M. Rambosek and deposited with Patent Counsel.

A new compound, both substantive and hydrophilic has been synthesized and will be evaluated as a hydrophilic handcream.

Antioxidants, such as sodium sulfite, will prevent hydrogels from browning with age.

2-Hydroxyethyl Carbamate

$HO\text{-}CH_2CH_2O\overset{O}{\overset{\|}{C}}\text{-}NH_2$

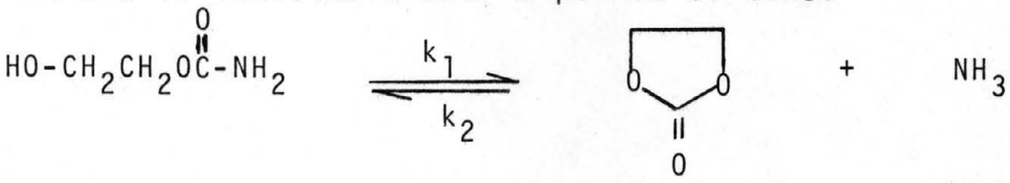
Useful as an intermediate in the preparation of a durable press cotton finishing agent, and for resins providing a high level of wrinkle resistance to cellulosic fabrics, 2-hydroxyethyl carbamate may also be employed for endcapping isocyanate prepolymers. In previous work, it was reported that 2-hydroxyethyl carbamate may be successfully substituted for 2-hydroxyethylimidazolidone in the preparation of the "EUCOL" type resins. The hydrophilic "Eucol" resins are finding applications in soft denture liners, antifog coatings, soft contact lenses and other uses, and the preparation and costs of these novel resins are becoming an important concern. 2-Hydroxyethyl carbamate is an attractive substitute for 2-hydroxyethylimidazolidone because it is commercially available (Jefferson Chemical Co.) and presently costs $0.30 - $0.40/lb. 2-Hydroxyethylimidazolidone, on the other hand, is not commercially available, and is both expensive ($1.40/lb.) and inconvient (purification step) to prepare.

While pure 2-hydroxyethyl carbamate is a colorless crystalline solid (m.p. 43°C), the anhydrous material available from Jefferson is a liquid containing 0.3% free ammonia, and about 1% ethylene carbonate by weight. In order to endcap isocyanate prepolymers successfully, 2-hydroxyethyl carbamate must be completely free of ammonia and preferrably free of ethylene carbonate.

Various attempts to purify the commercial material have been made; simple vacuum fractional distillation is not satisfactory because some ammonia is carried over into every fraction. Treatment with a cation ion exchange resin followed by vacuum fractional distillation serves as a means of purification,

but is unsatisfactory because of cost. The best method of purification consists of neutralization with concentrated hydrochloric acid followed by vacuum distillation. The fraction obtained at 124-125°/0.4-0.5 mm Hg is pure 2-hydroxyethyl carbamate, which after condensing, crystallizes upon standing a few days.

Jefferson's personnel believe that pure 2-hydroxyethyl carbamate is unstable with respect to dissociation to ammonia and ethylene carbonate, and that contamination with free ammonia is inevitable over a period of time:



Our work indicates that if such an equilibrium is to be established; it does so at an infinitesimally slow rate.

Pure, crystalline 2-hydroxyethyl carbamate, obtained by neutralization of the commercial product with HCl and fractionally vacuum distilling, was carefully analyzed for any formation of free ammonia over a period of ten weeks; the sample was stored in glass at room temperature. Using an analytical method capable of measuring 0.1 milligrams of ammonia, no ammonia formation could be detected in samples of 1 gram size. Since no ammonia was detected, k_1 in the above equilibrium cannot be calculated; however, the maximum value that k_1 could possibly be may be determined; assuming first order kinetics and that the rate of dissociation of hydroxyethyl carbamate is equal to the rate of formation of ammonia,

$$k \text{ diss } [HEC] = \frac{d\,[NH_3]}{dt}$$

$$k \text{ diss } [1000 \text{ mg}] = \frac{0.1 \text{ mg}}{10 \text{ weeks}}$$

$$k \text{ diss} = k_1 = \frac{10^{-4}}{10 \text{ weeks}} = \frac{10^{-4}}{1680 \text{ hrs.}}$$

$$k_1 \text{ (max)} = 5.9 \times 10^{-8}$$

This means that starting with pure hydroxyethyl carbamate, maximum dissociation could be 6 parts per hundred million (in ten weeks). The compound appears to be stable.

Concrete Primers

Isocyanate prepolymers have been surveyed for their ability to serve as concrete primers to promote the adhesion of polyurethanes to wet concrete. A series of 24 prepolymers was evaluated by painting the prepolymers on concrete blocks and overlaying with Tartan Seaming and Repair polyurethane; after curing, the prepared blocks were placed in water for 30 days and the peel strength of the urethane bond to the concrete measured at 90° peel angle (perpendicular to the concrete surface). The results are presented in Table I. The reader should be warned that the peel strengths of Table I are specific for the type of concrete used and the conditions of the experiment. Other concretes and conditions will produce entirely different numbers.

TABLE I

Peel Strengths (at 90° angle) of Polyurethane on Wet Concrete‡ As a Function of Primer.*

Primer	Tackiness after 24 hrs.	Peel Strength (lbs/in width)
1. Pluronic L43-TDI	tacky	1.50
2. Jefferson W1260-TDI	tacky	0.61
3. Carbowax 1000-Mondur-MRS	not tacky	2.75
4. Vcon Fluid 75HG 170-TDI	tacky	1.11
5. Jefferson WL 660-TDI	tacky	0.77
6. Carbowax 400-TDI	tacky	2.86
7. Polyoxyethylene Triol 600-TDI	not tacky	1.00
8. Vcon Fluid HG200-TDI	not tacky	0.44
9. Vcon Fluid 75H·125-TDI	tacky	1.32
10. MC442-MDI	tacky	9.90
11. Carbowax 400-MDI	not tacky	1.76
12. Polyoxyethylene Triol 1218 (I.E.)-MDI	not tacky	0.88
13. Polyoxypropylene Diol 400-MDI	not tacky	2.07
14. Polyoxyethylene Triol 1488- Hylene W	tacky	1.89
15. Carbowax 1540-TDI	not tacky	0.44
16. Pluronic L35-TDI	tacky	0.99
17. Polyoxyethylene Triol 1900-TDI	not tacky	0.00
18. Polyoxyethylene Triol 543-TDI	not tacky	1.58
19. Carbowax 6000-TDI	not tacky	0.40
20. Niax D520-MDI	not tacky	2.20
21. Carbowax 1000-MDI	not tacky	11.00
22. Carbowax 1000-TDI	not tacky	0.88
23. Carbowax 1000-TDI-A1100	tacky	0.44
24. Carbowax 4000-TDI	not tacky	0.0

‡ Blocks were soaked in water for 30 days before peeling.

* Primers applied as an acetone solution (20 g. in 30 ml acetone) with a brush.

The six best performers, primers number 3,6,10,13,20 and 21 were then evaluated on dry concrete. Again, solutions were applied to the concrete blocks, but this time the concentration was more dilute (5 g/30 ml acetone), and the polyurethane mixture poured over the cured primer. The best peel strengths (dry) are reported in Table II.

TABLE II

Peel Strengths (at 90°angle) of Polyurethane on Dry Concrete As a Function of Primer.∓

Primer	Peel Strength (lbs/inch width)
3. Carbowax 1000-Mondur-MRS	8.0
6. Carbowax 400-TDI	6.6
10. MC 442-MDI	10.0
13. Polyoxypropylene 400-MDI	>20.0*
20. Niax D520-MDI	12.0*
21. Carbowax 1000-MDI	10.0

∓ Concentration of primers in solution was 5 g. in 30 ml acetone.

* Cohesive failure of urethane; true peel strength not determined.

From the data in Table I it may be observed that Carbowax 1000-MDI (primer number 21) is the best performer on wet concrete, and from the data in Table II is can be seen that polyoxypropylene 400-MDI (primer number 13) is the best candidate for dry concrete. In order to determine if a mixture of these two primers might serve as a superior wet and dry primer, cement blocks were coated with solutions of a 1:1 mixture of primer number 21 and primer number 13 (5 g. of mixture in 30 ml acetone), and overlayed with polyurethane; peel strengths were then measured on both wet and dry samples and are reported in Table III.

TABLE III

Peel Strengths (90° angle) of Polyurethane on Wet‡ and On Dry Concrete As a Function of Primer.

Primer	Condition	Peel Strength(lbs/in. width
Carbowax 1000-MDI/PPG400-MDI(1:1)	wet	5
Carbowax 1000-MDI/PPG400-MDI(1:1)	dry	7
Carbowax 1000-MDI	dry	8
PPG 400-MDI	dry	>17*

‡ Prepared blocks were soaked in water for one week before peeling.

* Cohesive failure of polyurethane; true peel strength not measured.

The data in Table III indicates that a mixture of the best wet primer with the best dry primer produces peel strengths inferior to those obtained when either primer is used alone. It is concluded that their performance as primers cannot be improved by simply blending them.

These priming experiments were performed on high density, conglomerate concrete (2 x 5 3/4 x 12" slab weighs about 12.8 lbs $\cong$ 160 lbs/ft^3) which had a very tight smooth finish and was particularly non-porous. In an experiment with a less dense, more porous type on concrete slab (density $\cong$ 124 lbs/ft^3) it was observed that the Carbowax 1000-TDI prepolymer formed excellent adhesion to the wet concrete (even when applied to wet concrete).

Impregnated Materials For Leak Prevention

A novel method for stopping seepage and leaks of water has been devised. The method consists of stuffing or wedging into the water exits substrates that have been impregnated with a water-reactive prepolymer. Ideally, the substrate to be impregnated should be a material that "packs" well; it should be flexible and strong, capable of sharp bends, and should have the property of conforming well under pressure. In addition. the substrate should be porous so that it will be able to absorb the prepolymer; the final impregnated material should be tough enough to be forced into small cracks with the tip of a screwdriver without tearing.

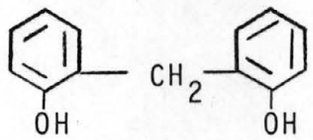
While materials such as ropes, scrims, sponges, soft woods, cardboard, reticulated foams, papers, felt, cork, asbestos, various fabrics and nets may serve as adequate substrates, a unique construction has been developed by A.W. Boese and V.W. Marquardt of NBVD which is even more suitable for this application. This new substrate consists of expanded, dry vermiculite sandwiched and heat sealed between two sheets of a "Herculon-Vinyon" rando web. Because of the excellent absorbability of the vermiculite, this new substrate is easily impregnated with hydrophilic prepolymers; when compresses, the impregnated vermiculite particles flatten into thin plates, and liberate their imbibed prepolymers; in the presence of water, the prepolymer reacts to form a swollen, rubbery hydrogel within the rando web, creating an insoluble plug to seal the water exit. The polymer has excellent adhesion to concrete and metal, and is tough enough to withstand pressure. Possible applications for the new, impregnated substrate are as damming materials for leaks in concrete walls, concrete floors, in metal, concrete, or plastic pipes, in underground structures such as manholes, or missile sites, in sewer lines, in ruptured hoses, and in general where

water issues from a small hole or crevice.

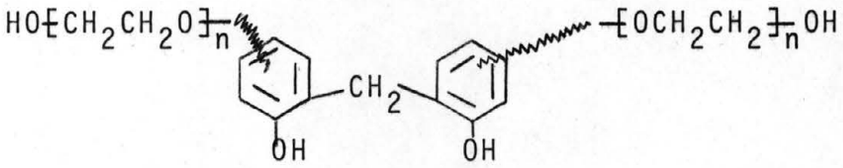
A Record of Invention entitled," Impregnated Materials For Damming and Leak Prevention" has been filed.

Substantive Hydrophilic Hancream

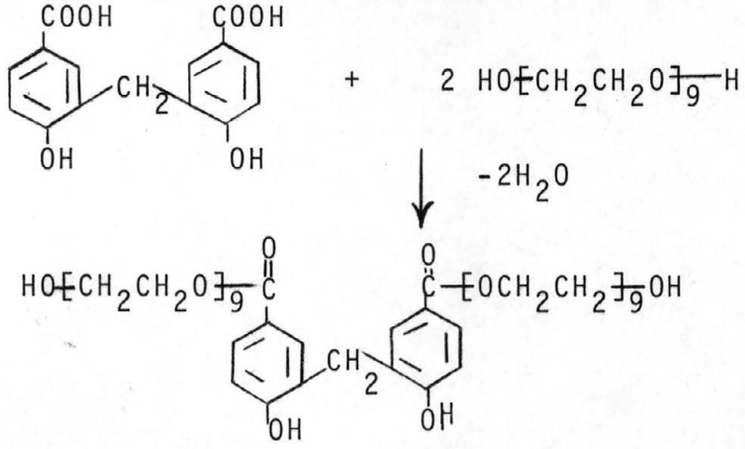
Work to develop a skin-moisturizing handcream that won't wash off after repeated washings with soap and water is being sponsored by the Commercial Tape Division. From the research of L.S. Endres [1] it is known that the chemical structure



imparts substantivity to animal skin. Using this finding, compounds of the class have been prepared.



The general approach here is to attach long, hydrophilic polyoxyethylene chains to the fundamental substantive unit; as a first course of action, attachment via ester linkages has been carried out. Thus by esterifying methylenebis-(ρ -hydroxybenzoic acid) with Carbowax 400 (n=9), the diester was prepared:



This compound has been submitted to H.J. Revoir for substrantivity determination, and has been found to be substantive to pigskin; the material remains bonded to the skin even after washings with hot detergent solutions.

Oxidative Darkening of Hydrogels

In a previous report [2] experiments were described which indicated that the darkening of hydrogels upon aging in water was due to oxidation; continuing work supports that conclusion.

Clear, colorless hydrogels, prepared from Carbowax 1000-TDI, were placed in distilled water and in 1% sodium sulfite solution, and allowed to age in clear glass bottles on the window sill. After two weeks, the hydrogel in the distilled water had turned to a dark brown color, but the sample in the 1% sodium sulfite solution remained absolutely colorless.

In still another experiment, colorless hydrogels were aged in a series of sodium sulfite solutions, ranging in concentration from 0.05% to 1.0%; a sample was also aged in distilled water as a control. It was observed that browning of the hydrogels proceeded first in the pure water, then in the 0.05% sodium sulfite solution, then in the 0.1% Na_2SO_3, and so on up to 0,75% Na_2SO_3. After 80 days in the sunshine, both the 0.75% and the 1.0% sodium sulfite solutions have prevented discloration of the hydrogels.

These experiments indicate that browning of the hydrogels certainly is due to oxidation, and that antioxidants can retard or prevent oxidative darkening of the polyoxyethylene based hydrogels.

EXPERIMENTAL

Purification of 2-Hydroxyethyl Carbamate

Commercial anhydrous hydroxyethyl carbamate (Jefferson Chemical Company) was neutralized to pH 6.5 with concentrated hydrochloric acid; and the mixture vacuum distilled at 0.4 mm Hg. Four fractions were obtained, a small fraction (water) up to 118°C; the second fraction, also small, was obtained at 119°-123°/ 0.4 mm; the main fraction distilled at 124-125°/0.4-0.5 mm, and after a few hours, crystallized at room temperature. This main fraction, 80-90% yield was pure hydroxyethyl carbamate and was free of water and ammonia.

Analysis of this sample every week over a ten week period showed no detectable ammonia (A40764); one gram samples were used for analysis, and the minimum detectable amount of ammonia by the method used was 0.1 mg NH_3.

Evaluation of Primers on Concrete

High density, low-porosity concrete blocks were painted with solutions of the primers. A corridor 1" wide was created by placing parallel strips of foam tape across the primed block; the sides of the tape served as walls of a mold into which was cast Tartan Surfacing Adhesive. A small piece of Mylar was placed at one end of each corridor to prevent the Tartan Adhesive from polymerizing onto the block surface at that point, thereby producing a "tongue" with which the peel strength could be measured. Cures were allowed to proceed at least four days before peeling dry; the cured blocks were soaked in water for 30 days for wet adhesion tests. All peels were made at 90° angle to the block surface.

The Preparation of Methylenebis(p-hydroxybenzoic acid)

Using the technique of LeBlanc[3] et. al., p-hydroxybenzoic acid (34.5 g) 0.25 moles, was dissolved in 100 ml oleum with cooling. Then paraformaldehyde (5 g.), 0.16 moles, was dissolved into the mixture and maintained at 80°C for 1/2 hour; after two days at room temperature, the reaction mixture was cautiosly poured over a liter of crushed ice. The resulting solution was neutralized to pH 3.5 with aqueous sodium hydroxide, and the entire solution evaporated to dryness under reduced pressure.

The white residue was ground to a fine powder and exhaustively extracted in a Soxhlet Extractor with anhydrous acetone; the product was soluble, but the undesired sodium sulfate remained in the thimble. The extractant was dried under vacuum and recrystallized in a minimum amount of water containing a few percent methanol. The recrystallized product was collected on a Buchner and dried under vacuum in a desiccator; total yield = 4.0 g.

Preparation of the Carbowax 400 Diester of Methylenebis-(p-hydroxybenzoic acid).

The above diacid (2.8 g) was heated with 16.0 g. Carbowax 400 in the presence of benzene and BF_3- etherate; the Carbowax is present in a two-fold molar excess. Water azeotroped from the refluxing reaction overnight. The BF_3 was reacted with 2 ml H_2O, and then the benzene and H_2O were removed under vacuum. The product was a straw-colored viscous liquid consisting of a 50% solids solution of the desired diester in Carbowax 400. The infrared spectrum (spectrum no. 89097E) shows no free carboxylic acid, but does show a strong ester carbonyl band at 5.8μ.

REFERENCES

1. L.S. Endres, Third Quarter Report, 1968 (763200-002); Fourth Quarter Report, 1968 and First Quarter Report, 1969 (763200-008); Final Report, August, 1969 (763200-013).

2. J.F. Kistner, Third and Fourth Quarter Report, 1970 (764200-010), page 12.

3. J.R. LeBlanc, D.B. Sharp, and J.G. Murray, JOC 26, 4731 (61).

John F. Kistner

J.F. Kistner

jc

cc:

A.W. Boese	53-5
A.C. Buchholz	230-1G
L.F. Gehlhoff	230-2S
L.M. Howell	209-1N
E.W. Janssen	209-1N
R.C. Kyle	201-1W
R.D. MacDonald	230-2S
J.J. Martin	208-1
V.W. Marquart	53-5
W.O. Ney	201-2S
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W.J. Paciorek	230-2S
G.M. Rambosek	219-1
H.J. Revoir	230-2S
C.A. Sterling	230-2S
L.J. Skruba	219-1N
B.F. Tungseth	219-1
J.W. VanValkenburg	201-2S
R.Y. Wen	201-1W
C.D. Wright	209-1N

Technical Communications 201-2S
CRL Directors, Managers, Supervisors
Organic Section

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Technical Communications Center, 201-2S

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3M COMPANY TECHNICAL REPORT SUMMARY

DATE: October, 1971

Corporate Innovative LABORATORY, DEPT. NUMBER 0508

Title
Third Quarterly Report - 1971

Project:

Project Number: 908731

Report No: (3 digits) 003

To:
A.W. Boese

By:
Vernon W. Marquart

Employee Number:

Objective:

Notebook Reference:

No. of pages including coversheet:

ABSTRACT and Conclusions. (System can accommodate 200-250 words)

SPECIFIC PROBLEMS remaining to reach objective.

SECURITY

[X] Company Confidential(Open)
[ ] Special Authorization(Closed)

IF SUMMARY REPORT

Has information in this report been covered by other reports submitted to TCC?

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[ ] Partially
[ ] Completely

Please keyword information not included in other reports and give page numbers of new material:

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3M CHEMICAL REGISTRY

New chemicals reported?

[X] No [ ] Yes

KEYWORDS

Select general, specific, and 3M product terms from 3M Thesaurus. Enclose suggested terms in parentheses.

3M - NBVD
Non-woven
Quarterly
Fiber
Binder
Curing
Testing
Flameproofing
Drying
Laminating

_____ Information Scientist Initials

WEB EXPERIMENT

On Aug. 9, 1971 I gave Louis Skriba some material I made 1-14-69 to experiment with. (Material - 3M Co. ace bandage with a non woven web needled onto it).

He said he was going to saturate the above web with John Kistners Hydrophilic polymer for the use of stopping water pipe leakage.

As requested by Louis Skriba I also made some blended webs with vermiculite in them to experiment with. (stopping water pipe leakage)

A Double Screen Saturator for Non Woven Webs.

We received two more samples of fabric from Formex Company to try on are saturator, and also the soft rubber nip rolls Don Yenni had made for us. The fabric with the finer weave of the two, along with the softer nip rolls gives us the best release and pick up control of all the fabrics and nip rolls we have tryed so far with this system.

Results of experiments we have tried with Rando web non-woven is that it makes a lot of difference which way the web is layed onto the carrier screen for the best nip roll release. Best results so far is when web is turned over before going into saturator.

When a web is made on a Rando Webber the fiber is formed on the condenser in a shingling formation, with the top fiber overlapping the lower fiber.

A garnett web does not shingle.

More experiments will be done with Rando web and garnett webs.

Rando Web Condenser Seal Experiment

Patrick Carey gave me a Rando Webber check list to look over from Dielectric materials and systems division. He pointed out to me that they use a nylon condenser seal pointed in direction opposite to rotation of condenser to stop the shingle effect in the web. I made a nylon condenser seal and put it in Rando so it pointed in opposite direction to rotation of condenser and ran three different web weights of 3 dem. 1 9/16" rayon web weights - 25#, 50#, 125#.

Results of experiment - there is less shingle effect in web! More experiments will be done using different fiber and length.

Web Experiment using John Kistners Hydrophilic Polymer for a synthetic shamois skin.

I took some blends of webs I made on the 12" Rando and needled at Bldg. 219 over to Dan Bishop, and we roll coated John's Hydrophilic Polymer into the webs, and then put webs in hot water to foam, then I put webs in the oven at 150 F over the weekend to dry. When I put webs in the hot water to foam, most of the foam came to the top of the webs. I will try using steam next time.

Form 6747-E

3M COMPANY TECHNICAL REPORT SUMMARY

DATE: Oct. 1971

TO:
Technical Communications Center, 201-2S

New Business Ventures LABORATORY, DEPT. NUMBER 0508

MICROFORM COPIES:

cc: A.W. Boese
E.W. DeZiel
M.R. Hatfield

Title
Third Quarterly Report - 1971

Project:
Expanded Non-Woven Fabrics and Webs

Project Number: 908701

Report No. (3 digits) 003

To:
W.S. Friedlander

By:
Howard L. Hoover

Employee Number: 48151

Objective:

Notebook Reference:

No. of pages including covershe

SECURITY

[X] Company Confidential(Open)
[ ] Special Authorization(Closed)

IF SUMMARY REPORT

Has information in this report been covered by other reports submitted to TCC?

[ ] No
[ ] Partially
[ ] Completely

Please keyword information not included in other reports and give page numbers of new material:

_____.

3M CHEMICAL REGISTRY

New chemicals reported?

[XX] No [ ] Yes

KEYWORDS

Select general, specific, and 3M product terms from 3M Thesaurus. Enclose suggested terms in parentheses.

3M - NBVD
Non-Woven
Quarterly
Fiber

ABSTRACT and Conclusions. (System can accommodate 200-250 words)

SPECIFIC PROBLEMS remaining to reach objective.

_____ Information Scientist Initials

3RD. QUARTERLY REPORT - 1971

On talking with Jim Lodge and Joe Graham regarding a Cost Accounting study to determine the feasibility of using my slitting technique to make their cut and fold artificial grass product, I find that they have anticipated us. They feel that if a satisfactory product can be made by the cut and fold procedure, the economics are favorable for a product to compete with the tufting method of production. They would be glad to go over these figures with you, Bill.

In opting for the pilot plant machine that we have discussed and designed we should remind ourselves of the other uses that seem potentially worthwhile. These include acoustic applications, perforated dry film adhesives, insulting constructions (honey comb type) and then the large number of suggested uses that Ed DeZeil mentioned in his letter of May 10th to me.

I am currently working on a new approach of making pile type products that may turn out to be an ideal manufacturing method for producing artificial grass and other products. This will be described in a subsequent report when reduction to practice formalities have been satisfactorily accomplished. I might add that this method of producing products does not eliminate the need for the above mentioned machine.

Howard Hoover

Howard L. Hoover

Form 6747-E

3M COMPANY TECHNICAL REPORT SUMMARY

DATE: October, 1971

TO:
Technical Communications Center, 201-2S

Corporate Innovative LABORATORY, DEPT. NUMBER 0508

Title
Third Quarterly Report - 1971

Project:
908731-002 908802-002 908806-001 908807-002

Project Number: | Report No: (3 digits)

To:
A. W. Boese

By:
Burton E. Frank

Employee Number:
12365

Objective:

Notebook Reference:

No. of pages including coversheet:

MICROFORM COPIES:
cc: D.D. Campbell
P.H. Carey
D.J. David
E.W. DeZiel
M.R. Hatfield
V.W. Marquart
J.R. Starkey
H.B. Walden

SECURITY
[X] Company Confidential(Open)
[ ] Special Authorization(Closed)

IF SUMMARY REPORT
Has information in this report been covered by other reports submitted to TCC?
[ ] No
[ ] Partially
[ ] Completely
Please keyword information not included in other reports and give page numbers of new material:
_____.

3M CHEMICAL REGISTRY
New chemicals reported?
[X] No [ ] Yes

KEYWORDS
Select general, specific, and 3M product terms from 3M Thesaurus. Enclose suggested terms in parentheses.

3M - NBVD
Non-woven
Quarterly
Fiber
Binder
Curing
Testing
Flameproofing
Drying
Laminating

ABSTRACT and Conclusions. (System can accommodate 200-250 words)

SPECIFIC PROBLEMS remaining to reach objective.

_____ Information Scientist Initials

Project 908731-002 Non-woven Products

(Research Items)

1. Acrylic & Nomex Webs for High Temperature Work

Several additional groups of webs were made up on the laboratory Rando for Al Boese's high temperature work. One group consisted of three sets of 7"x18" acrylic webs - (1) control webs; (2) webs identical to the control webs except that they were treated in the oven at 400 F. for 30 seconds before padding; & (3) webs made from fiber pre-treated in the oven at 400 F. for one minute. After padding with 20% HA-8 & a cure at 275 F. for two minutes, the oven treated webs & the webs from oven treated fiber proved to be substantially stronger than the controls. Also, the elongation values of the treated webs were considerably lower than those obtained on the control samples. Best all-around values were obtained on the webs which had been pre-treated in the oven at 400 F. for 30 seconds. An extension of this work was made, using both acrylic and Nomex fibers. Half of the trimmed webs from each fiber were pre-treated in the oven at 450 F. for 30 seconds. After padding all the webs with 20% HA-8, followed by a two minute cure at 275 F., the webs (except for the controls) were placed in the oven at 450 F. At 24 hour intervals, two webs (one with & one without pre-treatment) from each of the two types of fibers were removed from the oven. The acrylic webs became black with aging. Samples aged for 72 hours or more were too weak to be sampled for testing. The Nomex webs held up well for the complete test (96 hours), although they became progressively browner. For both fibers, there was an increase in tensile strength (& decrease in elongation) after the samples had been aged for 24 hours. On the acrylics the strength increase was about 50%, and on the Nomex, 100%. While the tensile strengths on the Nomex webs decreased with increased oven aging, after 96 hours they

were still about 20% higher than the tensile strengths of the control samples. In every case, on both fibers, the samples from the oven pre-treated webs were stronger than the corresponding untreated materials. This work will be continued.

2. Oven Pre-treatment of High Modulus Viscose Webs

After observing the beneficial effect of short-term, high-temperature treatment on webs of exotic fibers (before padding), we tried a similar experiment on hi mod viscose webs. Two fiber weights (11# & 18#) & two time intervals (30 seconds & one minute) were investigated. Briefly, a small increase in tensile strength was obtained (less than 10%) & no change was noticed in the elongation.

3. Triple Doffer System on the Laboratory Card

In an effort to produce heavier webs with a random orientation from the laboratory card, Herb Walden installed a third doffer roll in tandem with the present two doffers. Also he designed & installed the necessary supplementary equipment; brackets, a drive system, & a doffer comb with a variable speed adjustment. Webs of regular viscose were made up, padded, & tested. The ratio of cross-strength to machine-direction-strength on the samples was very high. However, it wasn't possible to increase the web weight as much as we had hoped. Herb is having the third doffer roll reclothed with another wire. With the new wire, we should be able to substantially increase the web weight, while maintaining (or improving on) the randomness of the fiber formation.

4. Fiber-Resin Ratio Work

A comprehensive experiment has been outlined by Al Boese & Pat Carey to investigate the effect of variations in fiber-resin ratio on the properties of non-woven webs. Sixty carded webs, of approximately 13

pounds each, were made from regular viscose staple fiber. These webs are to be padded with HA-8 solutions of various concentrations to obtain the desired fiber-resin ratios. In fact, some of the webs will have to be double-dipped to obtain the desired resin build-up. This work will be covered in next quarter's report.

5. Resin Printing

Sixty carded webs of high modulus viscose, also about 13 pounds in ream weight, were made for Al's pattern resin-printing project. Colored solutions of 20% HA-8 & 20% B-15 have been made up, & will be tried as time permits.

(Service Items)

6. Webs for Engineering Research

As a start on a new project for Engineering Research, we made Rando webs in a range of weights from regular viscose & hi mod viscose. The fibers were opened on an initial pass thru the Rando & the final webs were made on the second pass. After they have evaluated these cellulosic webs, we will undoubtedly be making more webs for them, probably from some of the hydrophobic fibers.

7. Webs for Dayco Corporation

Our initial sample webs, sent to Dayco recently for evaluation, were made on the laboratory card. After further consideration, we decided that Rando webs would be much easier for us to manufacture on existing production equipment, should actual orders be forthcoming. With this in mind, we duplicated the four carded webs, as closely as possible, on the laboratory Rando. Our tests showed that the Rando webs were remarkably similar in properties to the carded web samples (which they had already tentatively accepted).

Our next step was to schedule a run on the 40 inch Rando in Bldg. 219. The sample we chose to duplicate first was a 60 pound web, bonded with Gelva TS-100, giving a web with a final ream weight of about 100 pounds. Going into the run, we weren't even sure that this bonding agent could be handled on the equipment. Fortunately, with only relatively small quantities of fiber & TS-100 available, we were able to produce about 30 yards of good material which seems to duplicate the laboratory samples quite well. This material will be heat-bonded at Fairmont, & then tested on the Instron to see how closely the properties compare to those of the two laboratory samples (from card & Rando).

8. 3M Non-wovens

Arne Johnson requested that Herb Walden & I check over & correct where necessary a list of the raw materials & equipment used in the manufacture of all current3M non-woven fabrics. By contacting individuals in the various divisions, we were able to bring the chart up-to-date. In the future, we will try to update the chart at least twice a year.

9. Rando Webs for AC & S

The AC & S division has been using a non-woven fabric, made from polyester & bonded with Zytel in methanol, as a carrier for an adhesive. Now they want to investigate other fibers & binders for this product.

Five groups of fiber webs, with ream weights between 5 & 6 pounds, were made on the laboratory Rando & trimmed to 7"x18".

1.	AC & S Dacron (3.0x2")	15 webs
2.	Same fiber, washed	6 webs
3.	Same fiber, washed & treated with Z-6040	6 webs
4.	Herculon polypro (1.8x1½")	6 webs
5.	Dow-Badische Type 500 acrylic (3.0x2")	6 webs

Two webs from each group were padded with each of two solutions made up

by the AC & S laboratory. Then additional webs from the first group were padded with two other solutions of theirs, & also with 15% TS-100 & 20% HA-8 from our stock. All these padded webs were taken by them for evaluation. We expect to do more work for them later.

(General Items)

10. Pellon Testing

Pellon, a competitive, non-woven product, has been used by Nuclear Products as a fill-in dusting fabric while something better is under development by our group. (The big industrial use of Pellon is for fabric-stiffening interlinings). Samples of four grades of Pellon were obtained recently, & we performed a comprehensive series of tests on them to ascertain their properties. This data will find future use as a basis of comparison with similar data from experimental products which we produce.

11. Fiber Library

Our fiber library includes samples of all types of textile fibers & industrial fibers which are available on the market today, usually from more than one supplier & in several deniers & staple lengths. Periodically we audit the available commercial fibers, & check this listing against our inventory. Then fibers which tend to fill any gaps in our collection are ordered.

12. Glass Marquisette Web Carriers

Our glass marquisette carriers (between layers of which the dry webs are saturated & then passed thru the squeeze rolls of the padder) are cut from curtain panels. Generally they can be used about six times, with water emulsion pad solutions, before they become too sticky for further use. Herb Walden & I are working on better cleaning methods to extend the life

of these carriers. Quick water immersion & careful washing, with several rinses, appears to be all that is necessary to extend carrier life.
If solvent systems are used, immersion in acetone, followed by several rinses does a fair cleaning job.

908802-002 Service to Nuclear Products -Non-wovens

1. Dusting Fabric Run - Bldg. 219 Rando

Toward the end of a previous dusting fabric run (in May), we obtained a short yardage of very promising material. This material was made from a Fairmont fiber-blend of 60% polypro & 40% acetate, bonded with Zytel in methanol, & dried on release paper. The current run (about 500 yards) was set up with the idea that better material would be obtained if more attention were paid to the machine condition & settings. Also a heavier weight was to be made. While the quality still was not as good as we had hoped for, enough satisfactory material was produced for extensive testing by Don Yenni of Nuclear Products.

2. Fairmont Run of Dusting Fabric

This run was made on the garnett. A major objective was to try heat bonding, instead of resin migration, as the method of producing a relatively hard surface on one side of the web. The B-15 solution, as specified for Type 9000 dust cloth, was the first bonding solution tried. Fiber mix was again 60% polypro & 40% acetate, & fiber ream weight was 11 pounds. While the carding appeared to be good, the resulting web was weak, fuzzy, & full of holes, due to run-backs which occurred at the nip, across the entire width of the material. Then we doubled the quantity of B-15 in the pad solution & increased the fiber ream weight to about 12 pounds. No real improvement was noticed.
The heat bonding which followed (on the 14-2 Rando hot drum) was also not very successful. Our conclusion was that the padding system on the

garnett cannot be used successfully with this fiber mix & resin solution.

908806-001 Service to Medical Products

1. Fabric Drape Work for Jim Eggen

Jim Eggen ordered small samples of colored viscoe fiber from FMC for us to use in making webs for Fabric Drapes. Various combinations of clear & colored fibers, films, & solutions were tried. Some samples had webs on one side of the film, & others on both sides. Also webs were padded & dried without application to the standard, corona treated polyethylene film samples.

On a second group of fiber webs (all white), eight blue solutions with variations in resins and catalysts (made up by Jim E.) were applied. Some were laminated to films. Jim took all these webs with him for evaluation.

2. More Drape Runs

Jim E. is transferring to the Brookings plant. He came with his replacement, Chuck Newman, to run a final series of test drapes with another group of blue resin solutions which he had mixed. White webs were used, along with blue films and the blue solutions. Again all the sample drapes and webs were taken by Jim.

908807-002 Service to Gift Wrap

1. Webs for Molded Masks

Continuing our work on thermoplastic fiber mixtures for masks, another group of blended webs were made up on the laboratory Rando, with PVC as the major coustituent, for Charley Brix. Herb Walden did some re-vamping of our vacuum-former, and a few of the webs were formed into masks here. The balance of the webs were taken to Bldg. 230 to be tried. The main problem encountered at both sites was sticking to the molds.

3M COMPANY
MINNESOTA MINING AND MANUFACTURING COMPANY
GENERAL OFFICES • P. O. BOX 33800 • SAINT PAUL, MINNESOTA 55133, U.S.A. • TEL. (612) 733-1110

International Division

INTEROFFICE CORRESPONDENCE

SUBJECT: Equipment Layout Study
"Non-Woven Web Pilot Plant"

October 1, 1971

TO: A. W. HORNING

FROM: A. E. JOHNSON

This layout is intended to provide an initial starting point or basis for discussion to determine 3M's need for pilot plant facilities to support a number of products generally described as non-woven webs.

The most immediate consideration is to provide proper support for existing manufacturing operations.

A longer range consideration is to provide facilities to improve existing processes and products and to provide facilities to develop entirely new products.

The justification for expenditures is a management consideration based in part on how much money can be spent on these facilities as a ratio to sales and profit on existing products and also, how much can be spent, or is 3M willing to spend, on speculative new products in the non-woven web area.

Because the above bench marks are not available, it isn't possible to add this judgment in the scope of this initial look at pilot plant facilities.

BASIS OF STUDY

A laboratory is needed to develop basic principles to: provide an understanding of what makes processes work, evaluate raw material changes, and set up quality control and test standards. Lab considerations will be covered in a separate section.

A pilot plant is needed: to translate lab principles into practical manufacturing operations, to produce quantities of materials needed for marketing evaluation, to develop production economics, and to give engineering and manufacturing the assurance of providing a profitable business facility to 3M.

... continued

This layout is limited to an initial concept of pilot plant facilities. Other major factors, such as cost, are not considered at this time because they will logically follow the present question, "Are laboratory and pilot plant facilities beyond those presently available needed to support 3M's interest in existing and potential new non-woven web products".

In the pilot plant layout, we have drawn on the resources and expressions of many people over a period of years. The layout is an initial effort to consolidate these into an expanded pilot plant concept.

It should be noted that some pieces of equipment are existing and could probably be used in the final layout.

The following sheets describe the pieces of equipment and show the possible flow paths and the products that can be produced.

A E Johnson

AEJ:jf

EQUIPMENT LAYOUT STUDY
NON-WOVEN WEB PILOT PLANT

Equipment Sizing

The layout provides for a permanent installation of a majority of the equipment. The portable or set-up portion of the line is limited largely to the center portion, i.e. "Rando Weber", coating stations and conveyors.

The Garnets are 60" wide, the Rando Weber is 40" wide and the balance of the equipment is sized to pass a 48" wide web.

An area is shown on the layout for "related auxiliary processing equipment". This would include the following possibilities: mixing area, rewinding equipment, quality control station, die cutting equipment such as would be used for face mask trimming, and the possibility of other equipment used for new products where further or special processing equipment could be installed.

Possible Flow Paths & Product Produced

Flow Path C:

Produce light weight webs such as "Mistlon" or STB from a Garnett or Rando with a variety of coating and drying options.

Note: Crosslapper can be locked to pass an inline Garnett web to balance of line.

Crosslapper can be used to feed an inline batt to a Rando Weber. (Rando feeders not used anywhere in layout.)

Flow Path C & D:

Produce webs as in C, but with addition of laminations such as used for "fabric drapes" or Co-Ban.

Flow Path A & B:

Produce thick webs from a Rando Weber or from Garnett crosslaps "face masks". Note thick batts can be manually transported from the end of A to the beginning of B which is a similar process to the 40" Fairmont face mask line.

Flow Batch A-E & B:

Produce thick webs from a Garnett crosslap with the addition of laminations before the molder. New products (laminated face masks) or a variety of fiber and possibly filament layups for reinforced plastics; note: for reinforced plastics Path B may be replaced by auxiliary processing equipment.

Flow Path D:

Produce laminations using a variety of web products in a second trip operation. Laminations may or may not include a non-woven web in the construction.

A. E. Johnson
/gf
October 1, 1971

Non Woven Webs (Lab and Development Work Needed)

Making:

Web Forming - Need for thin non woven webs that have uniformity and are tailored to meet desired strength ratios. (Linear to crosswise strength ratios.) Some development work has been started on the machine designed to meet specific 3M needs.

Commercial machines:

A. Rando - Thick batts, larger deniers 10 to 15 and up
(we use 1-1/2 denier fiber [illegible] but our webs are poor)

B. Garnett or Card - Thin batts designed to orient fibers as for yarn making.

Web Coating - Need for coating method to apply resin for solution to webs without the problems of a two roll coater in which we in effect feed in a dry web and then attempt to get instaneous violent saturation. Results, run-backs, poor control of add-on, tendency for webs to follow rolls, short life of threaded rubber or wool sleeve rolls. The present coating methods are based on film technology or laying a coating on a surface, not saturated. 16

Web Drying - Need for drying methods to control resin migration and to control web temperatures for curing, Present film drying technology is used which results in a cold web until solvent is evaporated. When this method is used on non-wovens [illegible] migration to the drying side results. Need to work on vapor drying where web temperature would be up during drying and where migration could be controlled.

Converting:

Present converting costs for molded and flat masks are high and converting methods for product improvement are needed.

Need development on:

1. Reinforcing and/or means for attaching things to non-wovens.
   a. Molded masks - Stapes with concentration of load in one area to hold on elastic band could be improved.
   b. Flat masks - Bias addition and the use of sewing machines are time consuming, the quality is poor. We need better reinforcing methods than the use of sewing.

For above develop heat seal methods into fibers or compatible heat seal reinforcements.

Products:

Product development needed: some examples are

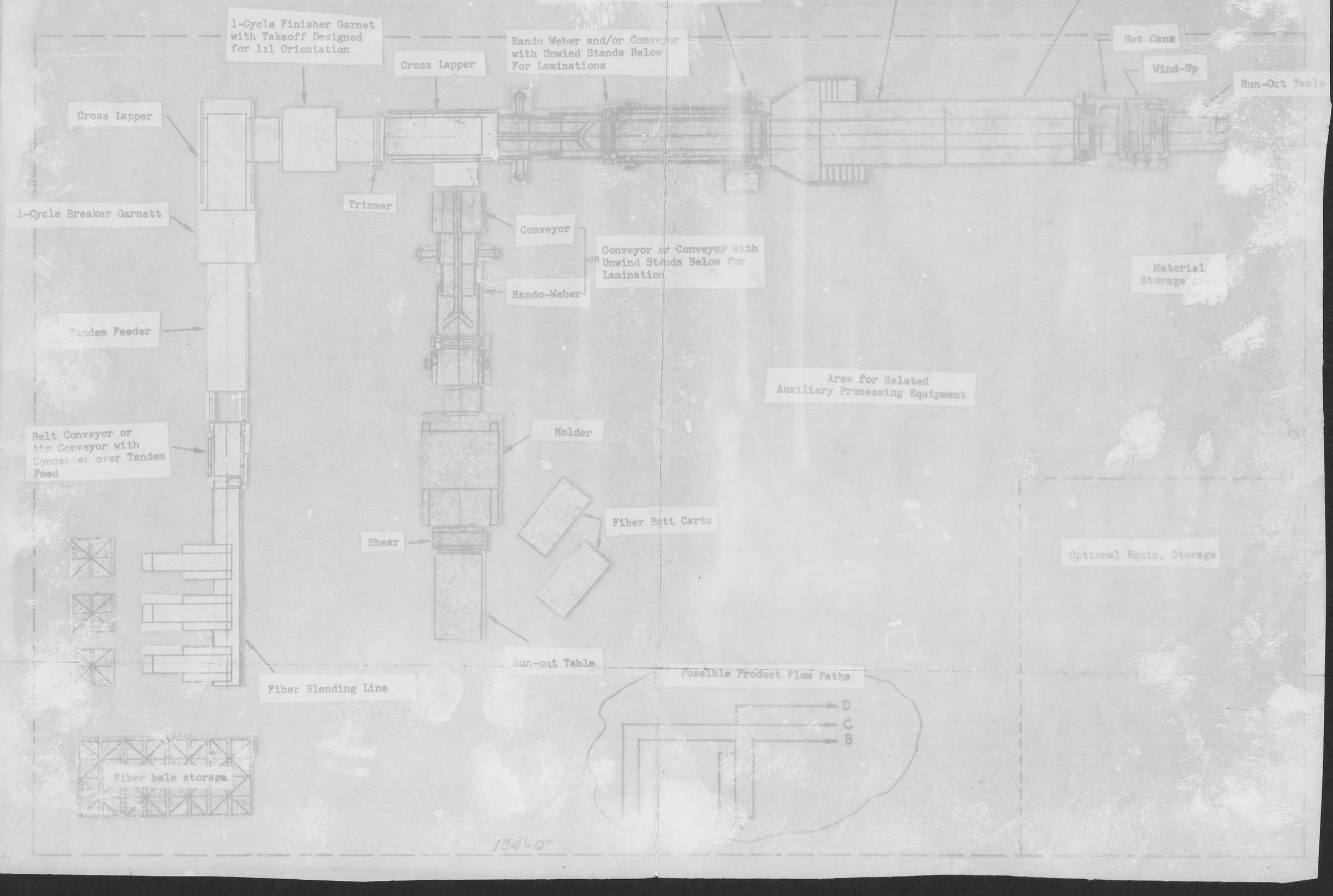
A. Adherance or fastening of non-wovens to a film, (fabric drapes).

B. Molded masks; outside of masks have the function of shap and should be kept clean, inside ofmasks should be non allergenic and comfortable to skin, ~~Inside~~ center layer of mask should be filter medium and be thicker (possible improvements included above would require a three web construction rather than the present blending of three fibers in a mixture.

EQUIPMENT LAYOUT STUDY
NON-WOVEN WEB PILOT PLANT

0 10 20
SCALE IN FEET

10-1-71



EQUIPMENT LAYOUT STUDY
"NON-WOVEN WEB PILOT PLANT"

0 10 20
SCALE IN FEET

10-1-71

Oven — Screen or Air Web Floatation
Straight thru Pass
Film Drying or Super Heated
Vapor Drying Types

Coating Stations — 2 Roll
Print Bonder
Airless Spray
Screen Saturator

Curing Section — Radiant Heat
Conventional Hot Air

1-Cycle Finisher Garnet with Takeoff Designed for 1:1 Orientation

Cross Lapper

Rando Weber and/or Conveyor with Unwind Stands Below For Laminations

Hot Cans

Wind-Up

Run-Out Table

Cross Lapper

Trimmer

1-Cycle Breaker Garnett

Conveyor

OR

Conveyor or Conveyor with Unwind Stands Below for Lamination

Rando-Weber

Material Storage Area

Tandem Feeder

Area for Related Auxiliary Processing Equipment

Belt Conveyor or Air Conveyor with Condenser over Tandem Feed

Molder

Fiber Batt Carts

Shear

Optional Equip. Storage

Run-out Table

Fiber Blending Line

Possible Product Flow Paths

D
C
B
E A

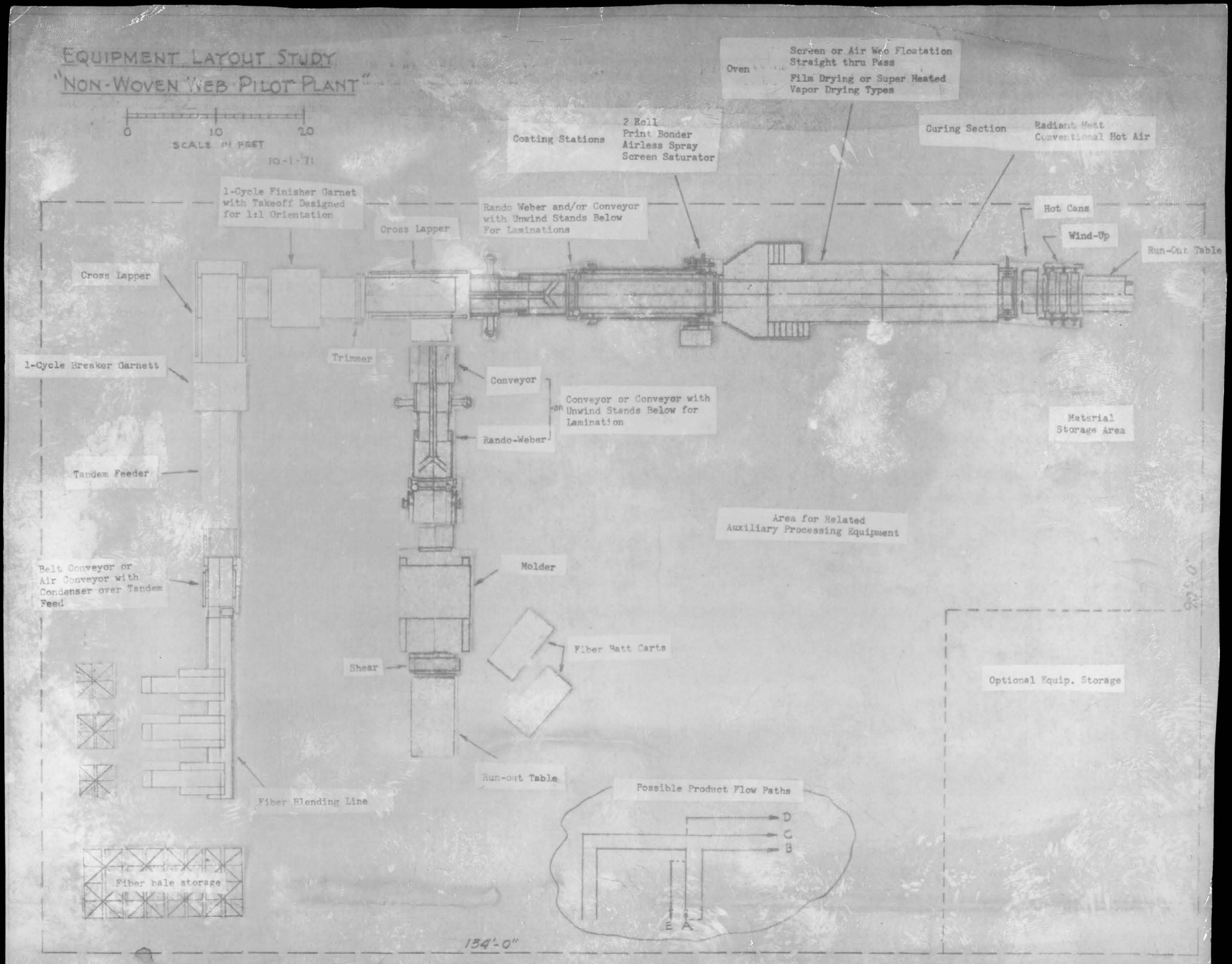
Fiber bale storage

134'-0"

EQUIPMENT LAYOUT STUDY
"NON-WOVEN WEB PILOT PLANT"

0 10 20
SCALE IN FEET

10-1-71



Form 6747-E

3M COMPANY TECHNICAL REPORT SUMMARY

DATE: December, 1971

TO:
Technical Communications Center, 201-2S

Corporate Innovative LABORATORY, DEPT. NUMBER 0508

MICROFORM COPIES:

Title: Fourth Quarterly Report - 1971

Project:

Project Number: 908731

Report No: (3 digits) 004

To: A. W. Boese

By: Vernon W. Marquart

Employee Number:

Objective:

Notebook Reference:

No. of pages including coversheet:

SECURITY

☒ Company Confidential(Open)
☐ Special Authorization(Closed)

IF SUMMARY REPORT

Has information in this report been covered by other reports submitted to TCC?

☐ No
☐ Partially
☐ Completely

Please keyword information not included in other reports and give page numbers of new material:

_____.

3M CHEMICAL REGISTRY

New chemicals reported?

☐ No ☐ Yes

KEYWORDS

Select general, specific, and 3M product terms from 3M Thesaurus. Enclose suggested terms in parentheses.

3M-NBVD
Non-woven
Quarterly
Fiber
Binder
Curing
Testing
Flameproofing
Drying
Laminating

ABSTRACT and Conclusions. (System can accommodate 200-250 words)

SPECIFIC PROBLEMS remaining to reach objective.

_____ Information Scientist Initials

(1) Pattern Bonding

Perforated metal migration heat bonding for non-woven webs.

Alvin Boese has come up with a good idea that might be used in bonding non-woven webs. The idea is to lay a saturated web on a hot sheet of perforated metal, and the binder thats in the web will migrate to the hot metal surface, leaving the web in a pattern bonded design. This may give us a web that has a better hand, and is softer then saturation bonding, and heat bonding alone.

Alving Boese, and myself will work together on this project along with the help of Burton Frank.

I have made up a wood and steel frame, and had some perforated metal cut to size, so we can go ahead and run some experiments on this bonding method.

(2) Pattern Bonding

Perforated metal migration heat bonding for non-woven web, and putting a pattern bonded design in cloth.

Alvin Boese and Burton Frank, and myself made some experiments using perforated metal, and a new all metal frame I made up.

Web fiber - 1 1/2 den., 1 9/16" hi. mod. rayon, web wt. dry - 13#

Binder for web - 20% HA-8 with green color.

Oven temp. - 275F

Metal frames and perforated metal were put in the oven for two hours to heat up.

1. saturation of web
2. layered web on bottom perforated metal
3. put top perforated metal on top of wet web
4. put top metal frame on top of perforated metal
5. left in oven for 5 min.

When we took the web out of the oven, we had a pattern bonded web.

We did the same thing with a cotton or rayon cloth.

Vernon W. Marquart

(1) A cast protection kit

When my wife took our daughter to the hospital to have the cast checked on her broken leg, the doctor noticed that the heel portion of the cast had become soft and had cracked. When the doctor was repairing the bad portion of the cast, another doctor came into the room and they told my wife that this is a problem they have with a plaster cast.

The cast must be kept dry, and not get cracked, if the soft or cracked spot in the cast gets to large, a new cast must be put on. This is not good to do once the fracture has been set.

In the conversation about this problem, they said there should be a method to help stop this problem in a plaster cast, specially on the lower part of the cast where it can get wet from snow and rain, and cracked on a hard surface.

After learning of this I took home some 3M Company ace bandage and a polyethlene bag and cut it to fit the lower part of the cast.

1. taped on cut polyethlene bag

2. folded over some ace bandage to form a pad.

3. wrapped around the above with more ace bandage.

The above experiment should last as long as the cast is on the leg.

I think if there is a great enough problem with this, 3M Company, should come out with some kind of a cast protection kit.

Something quick and easy that the doctor puts on, or the patient can buy and put on. A molded waterproof pad, or a kit.

Plaster cast protection

I talked to Paul Hanson of Med. Prod. Div. about a cast protection kit for a plaster cast. The problem is in the heel portion of the cast, it can easily get cracked and soft.

I suggested making and selling a kit, or using 3M Brand coban as a pad. I also told Paul about the singer felting needles.

Sewing needle sharpening strip.

I talked to Dr. Charles Fairbanks of Central Research about the needle sharpening strip he has developed.

I suggested to him that there may be a large manufacturing need for his needle sharpening strip, specially in felting needles. He is very interested in my suggestion. He said he would like to set up a meeting with Alvin Boese and myself to see if we can set up a testing program on his needle sharpening strip.

Vernon W. Marquart

Lab Needle loom

On 10-18-71 we received the 12" lub needle loom with auxiliary equipment. I cleaned, and set up needle loom to run experiments.

Synthetic chamois skin and wiping cloth, needled a Rando web with cellulose sponge in it. I got a web with a good hand, and the best wiping action so far of all the webs I've made. More experiments will be done using fiber blends and cellulose sponge.

12" lub needler 12-2-71

On 12-2-71 Douglas Campbell and Jerald Sturkey and myself had a meeting with Paul D. Voelkers, Product/Sales Manager from Singer-felting needler-needle Division, about the die-pressed type needles they have developed. Paul Voelkers claims this for there Singer needle.

1. less fiber distortion

2. less destruction of scrim material

3. more intensive fiber interlacing

4. more uniformity in needled materials

5. possible interlacing of brittle materials including glass fibers

6. increased needle working live up to 400 percent

7. reduced needle breakage - and therefore- improved quality of needled products, better economy in production facilities, expanded applications for needle punching.

J. Starkey is going to order about 1000 needles to try at 219-1 needler, he is also going to order me about 600 for the 12" lab needler.

Vernon W. Marquart

1971

Accomplishments

(1.) 35% of our time spent ~~in the~~ on problems of other Divisions ~~in the~~ either in development of new products or improving present products

(2) Continued broad studies of raw material and process to improve and develope nonwoven products & techs.

(3)

1. Equipment

(a) Development of dopping systems for garnett operations which would give a web with better strength distribution ~~cost~~.

This has been defined and accomplished on laboratory scale and is being refined for incorporation on production equipment.

Considerable time spent by Herb Walden in consulting with engineering and helping with the start up of nonwoven process in the Brookings plant.

~~Have~~ Consulted and helped define a nonwoven pilot plant for Tape Eng.

From our general studies of non woven technology two major directions evolved.

1.

We received fibers from Dow Badische Co. of a fibers made from a monomer of acrylonitrile which exhibit characteristics of stability that are not present in current marketed acrylic fibers.

We have determined that these fibers if tensioned at temps of 350° F to 400° F for a short time will with stand Temps of 500° F to 600° F for considerable time.

We intend to pursue this direction of development toward products such as filters, backings for abrasives and also in the electrical field.

The process evolved to develope this area would seem to be patentable both as a basic web structure and specific products.

Migratory bonding or migratory printing tech