Date: July 24, 1978

Project Title: Cotton Contamination by Polypropylene Bale Covers

Project No: E-27-666

Project Director: Dr. David R. Gentry

Sponsor: Amoco Fabrics Company, Patchogue Plymouth Division

Agreement Period: From 6/13/78 Until 9/30/78

Type Agreement: Letter dated 6/13/78

Amount: $1,000

Reports Required: Report on Preliminary Data

Sponsor Contact Person(s):

Technical Matters

Contractual Matters

J. W. Deas
Sales Representative
Industrial Fabrics Division
Amoco Fabrics Company
Patchogue Plymouth Division
Suite 150/550 Interstate North Parkway
Atlanta, Georgia 30339
404/955-0935

Defense Priority Rating: n/a

Assigned to: Textile Engineering (School/Laboratory)

COPIES TO:

Project Director
Division Chief (EES)
School/Laboratory Director
Dean/Director—EES
Accounting Office
Procurement Office
Security Coordinator (OCA)
Reports Coordinator (OCA)

Library, Technical Reports Section
EES Information Office
EES Reports & Procedures
Project File (OCA)
Project Code (GTRI)
Other
Date: March 20, 1979

Project Title: Cotton Contamination of Polypropylene Bale Covers

Project No: E-27-666

Project Director: Dr. David R. Gentry

Sponsor: Amoco Fabrics Company; Patchogue Plymouth Division; Atlanta, GA 30339

Effective Termination Date: September 30, 1978

Clearance of Accounting Charges: September 30, 1978

Grant/Contract Closeout Actions Remaining:

- Final Invoice
- Final Fiscal Report
- Final Report of Inventions
- Govt. Property Inventory & Related Certificate
- Classified Material Certificate
- Other

Assigned to: Textile Engineering (School/Laboratory)

COPIES TO:

- Project Director
- Division Chief (EES)
- School/Laboratory Director
- Dean/Director—EES
- Accounting Office
- Procurement Office
- Security Coordinator (OCA)
- Reports Coordinator (OCA)

Library, Technical Reports Section
EES Information Office
Project File (OCA)
Project Code (GTRI)
Other
Evaluation of Contamination of Cotton
by Olefin Bale Covers

submitted to
Amoco Fabrics Company
Patchogue-Plymouth Division

by
The School of Textile Engineering
Georgia Institute of Technology

August 3, 1978
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**APPENDIX**

Resume

List of Facilities
One of the applications for which fabrics made from olefin split film or tape yarn have been developed is a wrapping for cotton bales. This type of fabric reportedly has many advantages when compared with traditional jute bale covers. A distinct disadvantage exists, however, in the fact that olefin is virtually inert chemically and is not dyeable. If contamination of the cotton fibers by small pieces of the olefin yarn or fabric should occur, the contaminant will not be soluble in the preparation and finishing processes, nor can it be colored to the same shade as the cotton fibers. Such contamination would lead to obvious defects in the finished fabric.

Several evaluations have previously shown that contamination is not a serious factor. However, since approximately one-third of the cotton bales now produced are covered with olefin fabrics, apprehension of contamination problems is increasing among textile manufacturers although no significant problems have developed to date.

Nonfibrillated and fibrillated split film yarns in various lengths have been processed through carding at Georgia Tech. It was found that most of the nonfibrillated yarns will be discharged as waste at the lickerin without any breaking or fibrillation occurring. Small quantities of non-fibrillated yarn are apparently broken up and transmitted to the downstream components of the card: the cylinder and flats. Similarly, a large proportion of the yarns fed to the card in fibrillated form is transmitted by the lickerin to the cylinder and flats. Much
of the yarn is caught by the flats and subsequently removed as flat waste. Isolated pieces may become embedded in the teeth of the cylinder or removed as cylinder waste. Significant portions, however, are transmitted through the card along with the cotton fiber and contaminate the sliver delivered by the card.

Examination of the sliver indicates that most of the materials contaminating the sliver are passed immediately through the card. The polypropylene yarns were generally fed as a compact collection with the cotton lap over distance of 4 to 6 inches. Examination of the card sliver showed that contaminated lengths were relatively short, indicating that the contaminant was passed through the card almost immediately. Within the length of contaminated sliver, the initial portion appeared to have the greatest concentration with decreasing concentration toward the final portion.

Assuming contamination of a 50-yard length of card sliver, yarn contamination in lengths from 200,000 yards to one million yards can result, depending on the size of the yarn produced. Although blending occurs after carding, the important consideration is the attenuation in length of the card sliver. The length of fabric contaminated by this quantity of yarn would be a function of fabric construction and the application of the yarn as warp or filling.

Subsequent processing of contaminated card sliver has not been made at Georgia Tech; thus, the effects of the contaminant on product-process interactions is not known.
Objective

The objectives of this proposed investigation are:

(1) to determine the nature of the reaction of the yarn manufacturing processes to the olefin contaminant as it may appear in the cotton raw material;

(2) to determine the extent of contamination occurring in fabric, given the introduction of known "doses" of olefin contaminant in the yarn manufacturing processes;

(3) to determine the circumstances associated with the opportunities for contamination by olefin bale covers resulting from normal operating practices in mills; and

(4) to assess the probability and extent of contamination in finished fabrics which may result from normal operating practices.

Proposed Procedure

The proposed procedure is divided into two parts. Part A describes experimental work to be performed in meeting objectives (1) and (2), while Part B pertains to objectives (3) and (4).
Part A

Opening and Cleaning Investigation. Preliminary work to date has involved introducing the olefin contaminant at carding. In practice, the contaminant would be introduced at the initial process in the series of opening and cleaning processes. To investigate the effects of these processes on removal of olefin contaminant, a test will be made in which two grams of olefin yarn cut into short lengths will be fed with 25 pounds of cotton fiber to several opening and cleaning processes. These processes include a hopper feeder, an inclined opener (containing six beaters), and a Buckley beater cleaner. The system will be cleaned thoroughly prior to the test and all waste removed by each of the opening and cleaning processes during the test will be collected. Total waste at each process will be weighed and the olefin waste separated from the other waste materials. The fibers passed through the system will be examined to determine the extent of contamination by the olefin. An attempt will be made to account for all of the olefin contaminant introduced to the system. The olefin yarns will be examined after processing to determine the extent of damage or fibrillation caused by these processes.

Evaluation of Non-Fibrillating Yarn. Tests will be made at the carding process to determine the extent of contamination of card sliver by non-fibrillating olefin yarns. A two-gram quantity will be fed to the card, with the card permitted to run subsequently for a sufficient length of time to clear any revolving flats which might have trapped
portions of the contaminant (approximately twenty minutes). Waste under the lickerin and cylinder will be collected along with the flat strips. The amount of olefin contained in each of these wastes and in card sliver will be determined.

Yarn Processing Evaluations. Processing evaluations will be made to determine the effects of olefin contamination on processing performance, and to determine the extent of contamination of yarn produced from fiber stock initially contaminated at carding. Two series of tests will be run. In the first test one gram of olefin yarns will be added as contaminant and in the second, two grams will be added. In both tests, the contaminant will be made up of green and red yarns having various lengths and sizes. Some of the yarns will be fibrillated while others are not. Six combinations of yarn variables designated by the Sponsor will be contained in each test.

The olefin contaminant will be added in carding as a single dose. The card will be allowed to run for approximately 20 minutes following addition of the contaminant at a rate of 40-45 pounds per hour. All of the card sliver produced will be collected for subsequent processing. The wastes removed at carding will be collected and the quantity of olefin removed will be weighed. The card sliver will be processed into yarn according to the following schedule:
<table>
<thead>
<tr>
<th>Process</th>
<th>Number of Doublings</th>
<th>Draft</th>
<th>Weight or Number of Product</th>
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<tbody>
<tr>
<td>Breaker Drawing</td>
<td>8</td>
<td>8</td>
<td>50 grains/yard</td>
</tr>
<tr>
<td>Finisher Drawing</td>
<td>8</td>
<td>8</td>
<td>50 grains/yard</td>
</tr>
<tr>
<td>Roving</td>
<td>1</td>
<td>7.6</td>
<td>1.0 hank</td>
</tr>
<tr>
<td>Yarn</td>
<td>1</td>
<td>20.5</td>
<td>20.0 count</td>
</tr>
</tbody>
</table>

The entire yardage of each product will be collected for processing into the subsequent product. All wastes removed at each process will be examined and the quantity of olefin contaminant contained in the waste will be weighed. The operating efficiency of each process will be evaluated, with each machine stop or strand breakage counted. Inspections will be made to determine if stoppages are related to olefin contamination. Appropriate settings and speeds will be used in all of the processes, and these will be reported in detail.

The yarn will be rewound onto eight cones having equal weights. The yarns will then be knitted into a circular knit fabric on an eight-feed jersey machine. Any yarn remaining as white waste (because of uneven package runout) will be inspected for olefin contamination. The knitted fabric will then be bleached according to conventional bleaching procedures for 100 percent cotton. The fabric will be inspected for contamination, with the location of the contaminants throughout the rolls noted. Evaluations such as the number of contaminated yards of fabric will be made.
Part B

Determination of the circumstances associated with opportunities for contamination by olefin bale covers will require an assessment of the practices associated with movement and usage of cotton bales from the gin to the textile mill. It is proposed that this evaluation be made in conjunction with the National Cotton Council by inspection visits to a representative number of textile mills, cotton warehouses (both mill and commercial) and gins. From an assessment of the observed handling practices, a probability of contamination occurring at a particular source can be determined. Appropriate precautions and recommended procedures can then be developed which would prevent or minimize the probability of contamination occurring.

It is likely that the procedure followed in taking samples from the cotton bale offers the greatest opportunity for contamination. To assess the extent of contamination which occurs from this and other sources, a representative number of textile mills will be visited and inspections made of a large number of cotton bales as they are opened. The extent of olefin bale cover residue remaining in the vicinity of the cavity made by the incision of the sampling knife and removal of the sample will be determined by inspection. In the event that contamination is found, the olefin particles will be removed and weighed. The quantity of cotton which would have been fed from the bale along with the contaminant will also be determined.
The above field evaluations will provide an assessment of the potential for contamination of fibers in the bale. This information will then be combined with results of the processing evaluation described in Part A to determine the probability of contamination in finished fabrics. The extent of fabric contamination that is likely to result from a contaminated bale can also be estimated, given knowledge of the amount of contaminant and the nature of its distribution within a cotton bale.

It should be noted that although a procedure for Part B has been described, this proposal concerns itself for funding of Part A only.

Reports

Reports will be submitted to Amoco Fabrics covering each phase of the work outlined under Part A of the Proposed Procedure. Reports on each of the yarn processing evaluations will be submitted on completion of that work.

Timetable of Work

Work can be started upon finalization of the contractual matters. Work will begin on the yarn processing evaluations initially to facilitate economical use of the research assistant's time. While this work is proceeding, the opening and cleaning study and the non-fibrillating film study will be completed.
In the interest of maintaining maximum control over materials and waste, no more than 15 to 30 spindles will be used to spin the yarns. Thus yarn spinning will require a substantial amount of time since the spinning frame produces only 0.01 pounds per spindle per hour. It is anticipated that the entire program proposed in Part A can be completed within six months.

**Personnel**

Dr. David R. Gentry will be responsible for the program and will serve as Principal Investigator. Dr. Gentry has had over twenty years experience in the areas of fiber, yarn and fabric processing and the analysis of textile materials.

Mr. Paul Hilley will serve as a Consultant in this work. Mr. Hilley has recently retired as Vice-President for Greige Mill Manufacturing of Coats and Clark, and is now working with the School of Textile Engineering on a part-time basis.

Processing and analyses will be performed by research assistants employed by the School of Textile Engineering and will work under Dr. Gentry's supervision.

It is estimated that fifteen percent of Dr. Gentry's time will be required during the six-months period for completion of Part A of the proposal. Approximately thirty percent of one man-year (sixty percent during the six-month period) will be required from research assistants for Part A.
Manpower requirements for Part B have not been included in this proposal and will be the subject of further discussion with Amoco Fabrics.

Facilities

The School of Textile Engineering is equipped with all of the laboratories and processing equipment needed to perform this work.

A list of the School's facilities is appended to this proposal.

Patents

The likelihood of patentable information resulting from this investigation is low.

Proposed Budget
for Part A

Salaries
Dr. David R. Gentry $2,500
Research Assistant 3,120
Total Salaries $5,620

Overhead: 76% of Salaries 4,271

Retirement and Benefits: 9.83%
of Salaries 552

Cotton Raw Material 100
Laboratory Supplies and Equipment 100

Total Budget $10,643
BIOGRAPHICAL SKETCH

GENTRY, DAVID R. - Associate Professor
School of Textile Engineering
Georgia Institute of Technology

Education

B.S. in Textiles, Clemson College 1955
M.S. in Textile Technology, Institute of Textile Technology 1957
Ph.D. in Engineering Management, Clemson University 1972

Employment History

West Point Manufacturing Company, West Point, Georgia
Research Engineer 1957-1960

Clemson College, Clemson, South Carolina
Assistant Professor 1960-1965

Georgia Institute of Technology, Atlanta, Georgia
Lecturer in Textile Engineering 1965-1967

Phillips Fibers Corporation, Greenville, South Carolina
Manager of Testing and Evaluation in the Technical Service and Research Departments 1967-1973

Georgia Institute of Technology, Atlanta, Georgia
Associate Professor, Textile Engineering 1973-Present

Current Fields of Interest

Management functions in industry, including quality assurance, inventory control, and product control.

Characterization of textile products, specification and performance requirements of textile products.

Characterization of carpets to predict and use performance.

Technology of fiber, yarn, and fabric processing systems and its interrelationship with properties of textile materials.

Major Reports and Publications


"Weaving of Yarns from the Picker Spindle Study", Textile Research Dept. Report, Project 200, Clemson University, Clemson, S.C., Nov. 18, 1964


List of Facilities

I. Textile Evaluation Laboratories
II. Instrumental Analysis Laboratory
III. Microscopy Laboratory
IV. Textile Chemical Laboratory
V. Pilot Textile Wet Processing Laboratory
VI. Pilot Textile Dry Processing Laboratory
VII. Fiber Extrusion, Drawing and Texturing Laboratory
VIII. Thermal Analysis Laboratory
IX. Color Laboratory
X. Textile Processing Laboratories (Commercial Scale)
XI. Paper Laboratory
XII. Polymer Physics Laboratory
XIII. Fiber Composites Laboratory
XIV. Computer and Electronics Laboratory
XV. Machine Shop
XVI. Library
I. **Textile Evaluation Laboratories**

- Launder-Ometer - Atlas (2) (one of these is a high temperature machine)
- Viscograph and Amylograph - Brabender
- Scorch Tester
- Crock Meter - Atlas
- Moisture Tester AMT 1000
- Moisture Tester Semi-Auto - Brabender
- Atlas Finish Applicator
- Field-End Mill (for static measurements)
- Friction Apparatus (Rothchild)
- Industrial Skylight (Macbeth)
- Knit Shrinkage Gauge
- Digital Fibrograph with cotton blender, sampler
- Spinlab Cotton Colorimeter
- Mullen Ball Burst Tester (3)
- Suter Single Strand Tensile Tester (3)
- Uster Single Strand Dynamometer
- Scott IP-4 Tensile Tester
- Scott Model J Tensile Tester (4)
- Scott Model X Tensile Tester
- Sheffield Micronaire (3)
- Thwing-Albert Falling Pendulum Tear Tester (2)
- Scott CRE Tensile Tester
- Instron Model 1130 Tensile Tester with Automatic Output Module
- Instron Model TT Tensile Tester with Integrator and Compression Cells
- Instron High Temperature Environmental Chamber
- High Strain Rate Single Fiber Tensile Tester
- Fiber Comparator Torsion Tester
- Fiber Torsion Pendulum
- Fiber Creep Tester
- Searle Double Pendulum Fiber Bending Rigidity Tester
- Fiber Bending Recovery Tester
- National Appliance Vacuum Oven
- Stoll Universal Wear Tester
- Taber Abrasion Tester (2)
- Wyzenbeek Abrasion Tester
- Brabender Moisture Tester
- Suter Fiber Sorters for long staple and short staple fibers
- Pressley Fiber Strength Tester (7) and fiber combs
- Sauter Microbalance (6)
- Belger Roving Tester
- Gurley Densometer
- Frazier Air Permeability Tester
- Scott-Clemson Fiber Strength Tester
- Tinius Olsen MIT Folding Endurance Tester
- Spinlab Stelometer Fiber Strength Tester
- Acco Moisture Meter
- CSI Thickness Gauge
- FRL Cantilever Bending Tester
- Schieffer Compressometer
Textile Evaluation Laboratories (Continued)

Leavitt Microshear (carpet pile height and weight testing)
Morgan Dynamic Modulus Tester
Inso Vibroscope
CSI Tension Analyzer
Sheffield Package Density Meter
CSI Cohesion Tester
Various Balances (5)
Scott Model G Tensile Tester
Uster Model B Evenness Tester with Integrator and Spectrograph
Suter Twist Tester (9)
Atlas Crockmeter
Geler and Bluhm Yarn Abrasion Tester
Scott IP-2 Tensile Tester (2)
Various Yarn Reels
Garterh Cathetometer
Atlas Model 25/18 Carbon Arc/Xenon Arc Weatherometer
Atlas Model DMC Twin Carbon Arc Weatherometer
Whirlpool Heavy Duty Washer
Blue M Temperature-Humidity Cabinet
Monsanto Knit Fabric Stretch and Recovery Tester
Courtaulds Tetrapod Tester
WIRA Dynamic Carpet Tester
Constant Temperature Bath
Random Tumble Pilling Tester
Laboratory Oven
Textured Yarn Bulk Tester

II. Instrumental Analysis Laboratory

Aminco - Bowan Spectrofluorimeter
Differential Thermal Analyzer (Fisher)
Gas Chromatograph (Perkin Elmer)
Spectrophotometer IR10 (Beckman)
Polarograph - Heathkit
Carbon-Hydrogen Analyzer (Coleman)
PH Meters (2) Beckman)
Spectrophotometer, Recording (Beckman DB-G)
Colorimeter, Lumetron (Bausch and Lomb)
Electrophotometer II - (Fisher)
Spectrometers, Spectronic 70 (2) Bausch and Lomb)
Spectrometer, Beckmann DV
Aminco SPF-125

III. Microscopy Laboratory

Student Microscopes Scholar - Spencer (9)
Student Microscope Graf-Apsco (5)
Student Microscope Spencer - 60 PDSI (6)
III. Microscopy Laboratory (Continued)

Microtome
- Schwartz (1)
- Hardy (1)
- Sliding (1)
- Amdclaire (1)

Microscope, Polarizing, Spencer
Microscope, Measuring, Ealing
Microscope, Projecting, Bausch and Lomb
Microscope, Cycloptic, Spencer
Eye-Piece Micrometers (12)

Microscope, Stereo - Bausch and Lomb
Photomicrographic Camera, Bausch and Lomb Model L

IV. Textile Chemical Laboratory

Chromatography Equipment
- thin layer
- paper
- Praxitest with Recorder for sample dyeings

Equipment for synthesis of organic compounds
- Vacuum pumps
- Vacuum Oven - Fisher
- Muffle Furnace - Fisher
- Constant Temperature Baths
- Oven - Blue M Circulating

V. Pilot Textile Wet-Processing Laboratory

Dryer, Tumble, Huebach (2)
Centrifugal Extractor, 50 lb., Milnor
Centrifugal Extractor, 1 lb.
Stock Dyeing Machine, 50 lb., Morton
Package Dyeing Machine, 12 lb., Morton
Package Dyeing Machine, 1 lb., Venango
Kier, Pressure, 1 lb., Morton

Hosiery Dyer, Smith-Drum
Single Arm Skein Dyer, Smith-Drum
Beck, Single Piece, Riggs and Lombard
Chromalox Sample Dye Bath
Steamer, Greenville
Jig, Benz LJ 350
Washer, American Industrial
Sample Beck, Hunter
Paddle Wheel, 1 lb., Venango
Curing Oven, Despatch
VI. Pilot Textile Dry Processing Laboratory

- Open-end spinning heads
- Single End Silk Reel
- Sample Warper
- Callaway Slasher
- Sample Card - Platt
- Sample Drawing Frame - Platt
- Sample Spinning Frame - Platt
- 6 Spindle SKF Draft and Twist Tester
- Lawson-Hemphill Knitter - Yarn Analyzer, FAK
- Rosemund Sample Loom with Warper
- False-Twist Texturing Machine (2 spindle) - Also listed in Section VII
- 12 in Pass Type Tufting Machine
- 36 in Sample Tufting Machine
- 12 in Sample Needle-Punch Machine
- 2 in Sample Tufting Machine

VII. Fiber Extrusion, Drawing and Texturing Laboratory

1. Wet extruder, small pilot plant
2. Melt extruder, laboratory (under construction)
3. False twist texturing machine, 2 position, laboratory
4. Draw twister, Whitin model RYA-18

VIII. Thermal Analysis Laboratory

- Metler Thermoanalyzer (2)
- Vertical Flammability Tester - U.S. Testing
- Inclined Plane (45°) Flammability Tester - U.S. Testing
- Horizontal Flammability Tester - CSI
- Oxygen - Index Smoke Densitometer
- Test Equipment for Thermal Conductivity Studies
- Text Equipment for Radiative Heat Transfer Studies

IX. Color Laboratory

- Diatone/LSCE Automate (with Teleprinter)
- Color and Color Difference Meter - Hunter
- Opasometer - Photovolt
- Clarimeter - Central Scientific Co.
- Color Mixture Computer, COMIC I, Davidson and Hemmendinger

X. Textile Processing Laboratories (Commercial Scales)

A. Yarn Processing

- Opening-Cleaning
  - Blending feeder
  - Superior cleaner
  - Lattice opener
X. Textile Processing Laboratories (Commercial Scales) (Continued)

Carding
- Whiten Flat Top (2)
- Saco-Lowell Card Master Top
- Woolen Card with back section modified to run worsted type fiber

Drawing
- 4 delivery Saco-Lowell
- 4 delivery Whitin
- 2 delivery Ideal
- 2 delivery pin-drafter

Combing
- 1 2 delivery Saco-Lowell (6 head/side)

Roving
- 36 Spindle 12 X 6 Worsted - Saco-Lowell
- 36 Spindle 8 X 4 Whitin
- 16 Spindle 12 X 5 Saco-Lowell

Spinning
- 72 Spindle - Saco-Lowell
- 168 Spindle - Saco-Lowell
- 96 Spindle - Arrow
- 60 Spindle Woolen - Whitin
- 72 Spindle - Worsted - Saco-Lowell

Winding
- 20 Spindle - Leesona #44
- 6 Spindle - Universal #35
- 3 Spindle - Leesona #77
- 12 End - Sip-Eastwood
- 10 Spindle - Schlafhorst

Twisters
- 96 Spindle - Meadows
- 96 Spindle - Arrow
- 36 Spindle - Whitin
- 28 Spindle Uptwister - Atwood

B. Weaving

Quilling
- 15 Spindles - Whitin Schweiter
- 12 Spindle Abbott (circular creel)

Warping
- Single End Silk Reel
- Callaway Sample Warper
- Barber-Coleman Beamer

Slashing
- Cocker Slasher
Looms
   Cam
   Dobby
   Box
   Water-Jet
   Jacquard
   DSL Rapier Type

C. Knitting

Hosiery
   Rockwell Mark III-S
   Scott and Williams, Model H-H
   Scott and Williams, modified (2)
   Scott and Williams - Komet

Jersey
   32 Feed Scott and Williams
   Lamb

Rib
   Brinton - 8 feed
   Bentley - 4 feed Model TM
   Flat bed Rib-Lamb (2)

Links
   Circular Jacquard

Tricot
   Aveco - Sample width (2)

Raschel
   Karl Mayer 6 bar Model RML6F

Miscellaneous
   Cidega Chain Stitch w/weft lay-in
   Braiders - 16 tube (2)
   Warper for Tricot
   Ainslie circular hand knitting machines (6)
   Flat-bed hand weft knitting machine

D. Sewing

   Single needle machine (2)
   Overedger machine (2)

XI. Paper Laboratory

   Pulp Beater - Williams
   Pulp Digester - Williams
   Freeness Tester - Williams
   Sheet Mold - Williams
   Sheet Press Williams
   Sheet Dryer - Williams
XII. Polymer Physics Laboratory*

Light Scattering Photometer, Laser
Light Scattering Photometer, Mercury Arc
Gas sorption apparatus, high pressure
Digital data recording apparatus
High pressure, high temperature apparatus
Free piston gage, 0-5500 psi
Free piston gage, high precision, D-500 psi
Stress relaxation apparatus
Creep apparatus

XIII. Fiber Composites Laboratory

Callaway Slasher (previously listed) for making tape prepregs
Pasadena Press for fabricating laminates
Instron equipped with x-y recorder
Extensometer (2)
Extensometer calibrator
Jig for measuring flexural rigidity

XIV. Computer and Electronics Laboratory

A. Calculators and Computers

Toscal Electronic Calculators (8) (Toshiba)
Computer Calculator - (3) Hewlett-Packard
Card Reader (Hewlett-Packard)
2 K Memory Extension (Hewlett-Packard)
Plotter (Hewlett-Packard)
Digital Patch Panel Simulator
Analog Computer - Heath Educational
CRT Display
Interface Module (Hewlett-Packard)
TMX, ACR 33 Terminal
DEC Digital Logic Lab

B. Electronics

Amprobe AC Ammeter (2)
Hewlett-Packard Digital Voltmeter, Autoranging
General Radio Strobotac without Delay
AC-DC Meter
Custom Scientific Tension Recorder
Simpson Volt/Ohm Meter (2)
Capacitor Tester
Bergischer Electrostatic Field Meter
Oscilloscope, Single Beam 1 MHz (3)

*Textile evaluation equipment listed in I above also available for study of the physics of polymers.
B. Electronics (Continued)

Honeywell Strain Gage Amplifier
Voltage Calibrator, Marantz Audio Amplifier
RCA RF Signal Generator
Eico Audio Signal Generator
Hickok Tube Tester
Eico Regulated Power Supply
General Radio Sound Level Meter
General Radio Strobotac with Delay

XV. Machine Shop

13" engine lathe
10" bench lathe
automatic cut off saw
14" Delta Drill press
12" Craftsman Drill press
Delta & Disc Sanders
Electric arc welder
Miscellaneous hand power tools, saws, drill motors, grinders

XVI. Library

A. Georgia Tech Library (as of 9 March 1972)

Total Volumes 728,856 Volumes + 508,872 microtext volumes

Staff 75 (35 professional librarians + 36 clerical)
24 EFT Student Assistants

Volumes pertinent to textile field: 9,000 in textile classification + 24,000 volumes related in Math, Physics, Chemistry, Engineering, and Management.

Seating Capacity: 2,000

Number of hours of operation weekly: 100

BUDGET AND VOLUME GROWTH FOR PAST THREE YEARS

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<th>1968/69</th>
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<td>508,872</td>
</tr>
</tbody>
</table>

Program supported by strong collection in Mathematics, Physics, Chemistry, Engineering and by a more than adequate collection in Management. Outstanding collection of patents and standards add special strength.
The School of Textile Engineering has recently established a small library consisting of:

1. Approximately 1000 books and monographs
2. Approximately 60 periodicals (subscribed to) in areas of polymer, fiber, and textile science
3. Microfiche file for quick access to the catalog of the Georgia Tech Library.