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REPORT
OF ACTIVITIES AT
THE INSTITUTO UNIVERSITARIO DA BEIRA INTERIOR
COVILHA, PORTUGAL

May 15 to July 15, 1981

Hassan M. Behery
Professor of Textile Science
August, 1981

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REPORT
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COVILHA, PORTUGAL

INTRODUCTION

The activities rendered and presented in this report are part of the technical advice and assistance to the IUBI as required under agreements between the Government of Portugal and the Government of the United States, and Prime Contract No. AID/NE-1701 for the purpose of developing and strengthening the IUBI, formerly the polytechnical institute.

The report will cover the various activities carried out which included short courses, seminars, visits to textile mills and planning of future activities to be performed by Clemson. Recommendations are also outlined for the improvement of working conditions and performance of future advisors.

AREA OF CONSULTANCY

The major area of consultancy requested was Textile Technology, with emphasis on Nonwoven Technology.

OBJECTIVES OF THE VISIT

The objectives of the visit were to perform the following services:

1. Teach a Nonwoven Course

According to a letter from Dr. J. H. Atkinson dated April 6, 1981, he stated, "Dr. Behery's major activity

will be to teach a three credit-equivalent course in nonwoven fabrics to members of the staff and advanced students ... By means of this course and individual consultation with Dr. Behery, we expect that two IUBI professors will become prepared to offer such a course as a part of the curriculum in textile science."

2. Seminars on Nonwovens

As per the aforementioned letter, it was indicated that a second activity will be to present several seminars on nonwoven fabrics to industrial leaders.

3. Study on Rheology

It was indicated that Dr. Behery would confer with IUBI staff who are interested in the area of rheology, primarily for the purpose of beginning work in this area to be continued on his next visit.

4. Coordination of Clemson's Part

The other main objective indicated in Dr. Atkinson's letter was that the consultancy will allow Dr. Behery, as coordinator of Clemson's role in the program, to study the overall needs of IUBI and recommend ways Clemson can best help meet these needs.

5. Other Activities

Other activities were requested by Reitor Morgado. These activities included a seminar on Textile Physics and Technology, a joint paper to be published in the local journal of The Textile Institute, and assistance

in setting up new equipment received by the Textile Institute. Also, private consultation was provided to textile mills for construction of new nonwoven plants.

DURATION OF THE VISIT

The activities discussed in this report were performed between May 15, 1981 and July 15, 1981.

COUNTERPARTS

Two counterparts were assigned to work very closely with the different activities:

- A. Professor José Miguel Fiadeiro aided in coordinating the activities in the textile area.
- B. Miss Maria José Geraldés worked very closely with Professor Behery in the preparation of the classes for the nonwoven course, which she also attended. She performed a very active role in planning, and actually running the three nonwoven seminars. She acquired enough training to be able to organize and run seminars on nonwovens or other textile technology topics.

ACCOMPLISHMENTS DURING THE ADVISORY PERIOD

THE NONWOVEN COURSE

1. The Nonwoven Course

A. Course Schedule and Content

The course was scheduled for six weeks, beginning Tuesday, May 26, 1981 and ending Thursday, July 9, 1981. The classes met every Tuesday, Wednesday, and Thursday, from 5:00-8:00p.m. A schedule and course content was prepared and handed out to all participants. This is shown in Attachment 1.

Two faculty members from IUBI participated in the course as shown in the schedule attached.

It can be seen from the course content that this course covered materials in the following books and reference materials:

- i. Guide to Nonwoven Fabrics, by INDA, U.S.A.
- ii. Manual of Nonwovens, by Radko Krema.
- iii. Nonwovens '71, The Textile Press, Manchester, England.
- iv. Papers published in research journals and periodicals.

B. Reference Material

The reference material handed out to participants in the course is shown in Attachment 2. An outline for each section of the course was prepared in Portuguese by Miss Maria José (the faculty member who will be in charge of teaching this course in the future).

Attachment 3 gives examples of these outlines.

Material was presented by slides and transparencies. These were given to IUBI. A list of the slides is given in Attachment 4.

C. Participants

The course was attended regularly by senior class students, who also took the final exam for the course.

These students were:

1. Maria José Geraldês
2. José Mendes Lucas
3. Francisco Franco
4. José Morais
5. Mário Figueiredo Nunes
6. Paulo Dias Sandramo

Their percentage of attendance was from 80% to 100%. Several other persons from the industry and faculty of IUBI attended the course, but not on a regular basis. These were:

1. Maria Teresa Machado
2. Isabel Maria Araujo Mieirol
3. Célia Maria Pires Paula
4. Mário Tavares
5. Maria Orvide Pombo
6. Santos Silva
7. Borges Terenas

D. Final Examination

A final examination was given on Friday, July 10, 1981. The questions were prepared in English and later translated to Portuguese. Students preferred to answer in

Portuguese. The answers were graded with assistance from Eng. Borges Terenes (Director of the Section of The Textile Institute in Covilha), who also attended most of the lectures in the course. A copy of the final exam in English is shown in Attachment 5.

ATTACHMENT 1

NONWOVEN COURSE

June 15 - July 15, 1981

Schedule & Course Content

Class Period	Date	TOPICS	Pages
1	Tues, 26/5/81	Introduction & Nonwoven Booklet + Chapters 1&2 (INTRODUCTION) Crema	
2	Wed, 27/5/81	CH. #9 - Fibrous & Filamentary raw material and their Processing	
3	Thur, 28/5/81	CH. #10 - Technology of Production of Nonwoven Fabrics	
4	Tues, 2/6/81	CH. #3 - (1st Edition) Chemical Aspects of Adhesively Bonded Nonwoven (Dr. Isabel Ferra)	
5	Wed, 3/6/81	CH. #10 - Technology of Production of Nonwoven Fabrics	
6	Thur, 4/6/81	CH. #8 - Physical Aspects of Adhesively Bonded nonwovens	
7	Tues, 9/6/81	CH. #7 - (1st Edition) Adhesively Bonded to Backing Structure	
8	Wed, 10/6/81	Holiday	
9	Thur, 11/6/81	Nonwovens Applications (Parts 20 & 21 - Nonwovens '71)	243-254
10	Tues, 23/6/81	CH. 6 & 7 - Testing Nonwovens (Maria José)	
11	Wed, 24/6/81	Parts #2 & 3 - Nonwovens '71	11 - 32
12	Thur, 25/6/81	Parts #4 & 5 - Nonwovens '71	33 - 79
13	Tues, 30/6/81	Parts #6 & 7 - Nonwovens '71	73 - 90
14	Wed, 1/7/81	Parts #9 & 11 - Nonwovens '71	103 - 120, & 131 - 138
15	Thur, 2/7/81	Parts #12 & 13 - Nonwovens '71	139 - 169
16	Tues, 7/7/81	Parts 16 & - Nonwovens '71	201 - 234
17	Wed, 8/7/81	Discussion on Published Papers	per assignment
18	Thur, 9/7/81	Discussion on Published Papers	per assignment

ATTACHMENT 2

REFERENCE MATERIAL DISTRIBUTED
TO PARTICIPANTS IN THE NONWOVEN COURSE

1. "Guide to Nonwoven Fabrics"
Published by (INDA) Association of the Nonwoven Fabric Industry, 10 East 40 Street, New York, New York, 10016.
2. "Progress in Nonwovens"
Papers presented at a Shirley Institute Conference on 28 Nov., 1975.
Printed by the Shirley Institute, Manchester M20 8RX, England.
3. "Study of Mechanical and Physical Properties of Commercially Available and Mechanically Bonded Nonwoven Fabrics"
Hassan M. Behery, Textile Department, Clemson University (April, 1972).
4. "Application of Nonwovens in Geotextiles"
Hassan M. Behery, Paper presented at the Symposium on New Development in Nonwoven Textiles at the Second Chemical Congress of the North American Continent, Las Vegas, Nevada (August, 1980).
5. "Ninth Technical Symposium: Nonwovens in the 80's: Years of Change"
Book of Papers published by INDA: Association of the Nonwoven Fabrics Industry, 1700 Broadway, New York, New York, 10019.
6. "Manual of Nonwovens"
by Radko Kresma
published by Textile Trade Press, Manchester, England.
7. "Nonwovens '71"
Collected and Revised papers presented to the short course on "Nonwoven Fabrics" at the University of Manchester Institute of Science and Technology, UMIST, December, 1970. Organizers, J. W. S. Hearle and M. S. Burnip, Editor: Peter Lennox-Kerr. Published in U.S.A. by Textile Book Service, Inc., P. O. Box 25, Broadway, New Jersey, 08808.

NÃO - TECIDOS

26/5/81

"Guide to Nonwoven Fabrics"

1. Prefácio (pág. 1)
2. Introdução (pág. 2 a 4)
3. Tendências do Mercado (pág. 5 e 9)
4. Vantagens do uso dos Não Tecidos:
 - 4.2.1. Artigos não recuperáveis tais como fraldas e lenços de papel (pág. 12)
 - 4.2.2. Coated Fabrics (pág. 12 e 13)
 - 4.2.3. Produtos Médico/Cirúrgicos (pág. 13)
 - 4.2.4. Forros de alcatifas (pág. 14)
 - 4.2.5. Entretelas (pág. 14 e 15)
 - 4.2.6. Materiais de Construção Civil (pág. 15)
 - 4.2.7. Artigos de limpeza industrial e doméstica (pág. 16 e 17)
 - 4.2.8. Toalhetes Humidificadores (pág. 17)
5. Processos de fabrico dos Não-tecidos (pág. 18)
 - 5.1. Processo seco (pág. 19)
 - 5.2. Processo por aglutinação de fios (pág. 20)
 - 5.3. Processo por entrelaçamento de fios (pág. 21)
 - 5.4. Processo por extrusão de filmes (pág. 21)
 - 5.5. Processo húmido (pág. 22)
 - 5.6. Agulhetagem (pág. 22)
6. Processos de Avaliação de Algumas Propriedades dos Não - Tecidos (pág.24)
7. O que é a INDA? (pág. 25)
8. Publicações da INDA (pág. 26)
9. Informações Adicionais (pág. 27)
10. Glossário

NAO - TECIDOS

27/5/81

Sumário

"Nonwoven Textiles" - by Radko Kréma

Capítulo 2: Matérias primas fibrosas e filamentar e respectiva manipulação ou tratamento - pág.22

2.1. Matérias primas fibrosas e filamentar - pág. 23

2.1.1. Principais propriedades das matérias primas fibrosa e filamentar - pág. 25

A. Propriedades geométricas - pág. 25

B. Propriedades mecânicas - pág. 27

2.1.2. A estrutura da fibra e respectiva importância no fabrico dos Não-Tecidos - pág. 30

2.1.3. Uso dos principais tipos de fibras e filamentos nos principais grupos dos Não-Tecidos - pág. 40

2.2. Formação do véu para os Não-Tecidos - pág. 41

A. Segundo os princípios da operação de cardação - pág. 50

B. Segundo os princípios da operação de cardação e desfibrção pneumática - pág. 76

NÃO - TECIDOS

Sumário

2/6/81

"Manual of Nonwovens" by Radko Krema

Capítulo 8: "Aderência e ligação" - pág. 107

1. Termos e definições - pág. 108
2. Princípio geral - pág. 109
3. Mecanismo do processo de ligação - pág. 113
4. Factores que influenciam o processo de ligação - pág. 114
 - 4.1. Tensão superficial - pág. 115
 - 4.2. Limpeza e dimensões da superfície - pág. 118
 - 4.3. Espessura da camada adesiva - pág. 120
 - 4.4. Tempo e pressão de aplicação da camada adesiva - pág. 120
 - 4.5. Tempo e temperatura de aplicação da camada adesiva - pág. 121
 - 4.6. Composição química - pág. 123
 - 4.7. Grau de polimerização - pág. 123
 - 4.8. Polidispersão - pág. 124
 - 4.9. Polaridade das moléculas - pág. 125
 - 4.10. Propriedades de absorção do substracto - pág. 125
 - 4.11. Viscosidade - pág. 126
 - 4.12. Propriedades reológicas - pág. 126
5. Condições proporcionadoras da "stickiness" necessária - pág. 129
 - 5.1. Condições proporcionadoras da adesão óptima - pág. 130
 - 5.2. Condições que diminuem a "stickiness" - pág. 132
6. Testes de aderência e viscosidade - pág. 134
7. Produtos adesivos para artigos não-tecidos e problemas no seu desenvolvimento -
- pág. 135
 - 7.1. Introdução - pág. 135
 - 7.2. Propriedades adesivas requeridas - pág. 136
 - 7.3. Aplicabilidade dos adesivos em artigos não-tecidos - pág. 137
8. Bibliografia - pág. 142

NÃO - TECIDOS

Sumário

3/6/81

"Manual of Nonwovens" by Radko Krema

Capítulo 10: "Tecnologia da Produção dos Não-Tecidos" - pág. 199

- 2. Principios da Produção de Não - Tecidos ligados Mecanicamente - pág. 231**
 - 2.1. Sistemas baseados na interligação de fibras simples - pág. 321**
 - 2.2. Sistemas baseados na interligação de mechas (conjuntos) de fibras -
Técnica da agulhetagem - pág. 233**
 - 2.3. Sistemas de ligação sem recurso ao uso de fios reforçadores - pág. 2**
 - 2.4. Sistemas de ligação baseados no uso de fios reforçadores - pág. 238**

ATTACHMENT 4
SLIDES OFFERED TO IUBI

		<u>Number of Slides</u>
1	Figures from Manual of Nonwovens by Crema (1st Edition)	120
2	IBID, (2nd Edition)	80
3	Nonwoven Products	109
4	Nonwoven Markets and Growth	35
5	Nonwoven Properties Characteristics Requirements	18
6	Nonwoven Binders	21
7	Nonwoven Machinery	57
8	Nonwoven Fabrics	67
9	Nonwoven Methods & Processes	58
10	Nonwoven, Misc.	8
		<hr/>
	TOTAL	<u>573</u>

ATTACHMENT 5

FINAL EXAM

Nonwoven Course

At IUBI

Held Between May 15 - July 10, 1981

Answer the following questions:

1. What are the four major steps for the production of nonwoven fabrics?
2. Explain briefly the different methods by which the fiber web is prepared for nonwoven fabric production.
3. Discuss the main factors that affect the properties of the needle-bunched nonwoven fabrics.
4. Discuss the main factors that affect the properties of adhesively bonded fabric?
5. Explain the main function of the machines shown in the attached figures.
6. Give the names of five different types of fibers used in nonwoven industry.
7. Give the names of three different types of adhesives used in nonwovens.
8. What are spun-bonded nonwovens and what are their major application?
9. Mention 5 different applications of disposable nonwovens.
10. Mention 5 different applications of durable nonwovens.

ACCOMPLISHMENTS DURING THE ADVISORY PERIOD

SEMINARS ON NONWOVENS

2. Seminars on Nonwovens

A. Topics of the Seminars

Three seminars were planned for the industry on the subject of nonwovens. The topics covered by these seminars were as follows:

- i. "Fundamentals of Nonwovens"
- ii. "Advances in Nonwovens"
- iii. "Latest Developments in Nonwovens".

Reitor Morgado has indicated that he would like to see members of IUBI faculty, and also the Textile Institute in Covilha, participating in these seminars. The objective of this participation is to provide the following:

- a. strong relationship that needs to be built between the industry and IUBI, and
- b. participants from the industry will be encouraged to attend, as some of the material will be presented in Portuguese.

It can also be seen that the topics covered ranged from fundamentals to the most recent applications of nonwovens in Geotextiles.

B. Brochures of the Seminars

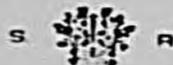
The brochure for the first seminar was prepared in English, except for a few names and addresses of local hotels. A copy of the draft of this brochure is shown in Attachment 6. Reitor Morgado indicated the necessity of having the brochure presented to the industry in Portuguese, except for the titles of the subjects presented by

Dr. Behery. This will facilitate studying the brochure and also attracting more participants. Reitor Morgado was pleased to see the effective participation of the faculty and industrial personnel in the seminars. Copies of the brochures mailed to the industry are also presented in Attachment 6.

C. Development of Mailing List

For mailing the brochure of the first seminar, no effective mailing list was available. However, copies were mailed to several local organizations for distribution to their members, such as ANIL and The Textile Institute. This method was not as effective as it was expected. But, after the first seminar and a discussion with the participants, we were able to locate 14 companies specializing in nonwoven products. These companies are shown in Attachment 7.

Direct contact was established with these companies, and speakers were invited to participate in the second and third seminars. The response also increased and these developments were received with a great deal of satisfaction by Reitor Morgado.



Ministério da Educação e Ciência
DIRECÇÃO-GERAL DO ENSINO SUPERIOR

INSTITUTO UNIVERSITÁRIO DA BEIRA INTERIOR

RUA MARQUÊS D'ÁVILA E BOLAMA
TEL. 2 51 4172

6200 COVILHÃ

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ATTACHMENT 6

SCHEDULED AS FOLLOWS

First Seminar:

FUNDAMENTALS OF NONWOVENS

Date:

(June 9 & 10, 1981)

Second Seminar:

ADVANCES IN NONWOVENS

Date:

(June 24 & 25, 1981)

Third Seminar:

**LATEST DEVELOPMENT
AND FUTURE OF NONWOVENS**

Date:

(July 1 & 2, 1981)

ABOUT THE SEMINARS

Language

The Seminars will be conducted partly in English and partly in Portuguese. Faculty of IUBI will participate as well as help in some spot translation from English to Portuguese whenever necessary.

Topics

The topics discussed in these seminars will cover the fundamentals of Nonwovens: methods of manufacture, products application, testing and economic and future trends. This course will be beneficial for those who would like to get into this rapidly growing technology in the textile industry.

The three seminars are designed to cover the fundamentals of the nonwoven technology, which will provide the basic understanding. Also the advancements that took place in this industry over the last ten years will be presented in the second seminar of this series. The final seminar will discuss the latest developments and the future forecasts.

Who Should Attend

The seminar will be beneficial to personnel in first line supervision, middle management and management. A college degree will be helpful but not necessary to attend these seminars. Familiarity with textile processes is assumed. All types of fibers processors will find these seminars useful.

Fees

No fees will be charged, but participants have to make their hotel reservations. Meals and coffee break will be provided on a cash basis.

Welcome you to attend
a three Seminar series

NONWOVENS
(não tecidos)

FIRST SEMINAR

FUNDAMENTALS OF NONWOVENS

JUNE 9 & 10, 1981

PROGRAM

TERÇA FEIRA, 9 de JUNHO de 1981

- 9.30 Welcome
Prof. Doutor C. M. Passos Morgado, Rector of Instituto Universitário da Beira Interior
- 9.15 Introduction & Overview
Maria José Geraldes (Monitora do IPII)
- 10.30 Machinery and Methods Used In Nonwoven Manufacture
Dr. Hassan Behery (AID Advisor)
- 11.15 Break
- 11.30 Web Formation
Dr. Hassan Behery (AID Advisor)
- 12.15 Lunch
- 14.00 Wet - Laid Nonwovens
Dr. Hassan Behery (AID Advisor)
- 14.15 Binders Used In Bonded Fabric Production
Dr. Maria Isabel Ferra (Assistente IPII)
- 15.50 Break
- 16.00 Adhesive - Bonded Nonwoven Fabrics
Dr. Hassan Behery (AID Advisor)
- 16.30 Adjourn

QUARTA FEIRA, 10 de JUNHO de 1981

- 9.30 Mechanically Bonded Nonwovens
José Lucas (Monitor do IPII)
- 10.15 Spunbonded Nonwoven Fabrics
Dr. Hassan Behery (AID Advisor)
- 11.00 Break
- 11.15 Survey of Nonwoven Fabric Application
Maria José Geraldes (Monitora IPII)
- 12.00 Lunch
- 14.00 The Economic Future of Nonwovens
Dr. António Marques Mendes (Assistente IPII)
- 14.15 Advances in Nonwoven Fabrics
Dr. Hassan Behery (AID Advisor)
- 15.30 Adjourn

ACCOMODATION

Please make your own accomodation in any of the following hotels:

QUARTO DUPLO

Com Banho

Pensao Solneve	615\$00
Residencial Montalto	-
Residencial Floresta	600\$00
Varanda dos Carqueijais	1.600\$00

QUARTO SIMPLES

Com Banho

Pensao Solneve	440\$00
Residencial Montalto	695\$00
Residencial Floresta	500\$00
Varanda dos Carqueijais	1.100\$00

(tear along line and return)

RESERVATION

To attend the seminar please fill the form below and mail to:

Instituto Universitário da Beira Interior
Gabinete do Prof. Hassan Behery
R. Marquês d'Ávila e Bolnha
6200 COVILIA CODEX

Name: _____ Position: _____
 Affiliation: _____
 Address: _____ Telephone: _____

I would like to attend:

First _____ Second _____ Third _____ Seminar _____



Ministério da Educação e Ciência
DIREÇÃO GERAL DO ENSINO SUPERIOR

INSTITUTO UNIVERSITÁRIO DA BEIRA INTERIOR

RUA MARQUÊS D'ÁVILA E SOUSA
TELEF. 25141/2
6290 COVILHÃ

Bem-vindos aos três Seminários

sobre

NÃO-TECIDOS

(nonwovens)

Assistentes de IUBI, técnicos especialistas do Instituto dos Têxteis e consultores do programa AID farão a apresentação e conduzirão as discussões sobre o rápido crescimento desta nova tecnologia.

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ATTACHMENT 6 (Cont.)

PROGRAMA

Primeiro Seminário:

NOÇÕES BÁSICAS SOBRE NÃO-TECIDOS

Data:

(16 e 17 de Junho, 1981)

Segundo Seminário:

PROGRESSO NOS NÃO-TECIDOS

Data:

(24 e 25 de Junho, 1981)

Terceiro Seminário:

ÚLTIMAS INOVAÇÕES E FUTURO DOS NÃO-TECIDOS

Data:

(1 e 2 de Julho, 1981)

OS SEMINÁRIOS

Língua

Os Seminários serão dados parte em Inglês e parte em Português. Os assistentes do IUBI participantes poderão fazer um resumo em Português das exposições quando se julgar necessário.

Temas

Os temas discutidos nestes Seminários tratarão de noções básicas sobre Não Tecidos: processos de fabrico, utilização de produtos, ensaios e tendências económicas e outras. Este curso interessará a todas as pessoas que queiram interiorizar-se do rápido crescimento desta tecnologia na indústria têxtil.

Estes três Seminários cobrirão as noções básicas da tecnologia dos Não Tecidos, dando aos participantes os conhecimentos necessários. O segundo seminário versará sobre o progresso que esta indústria sofreu nos últimos 10 anos. No terceiro e último Seminário, falar-se-á sobre as últimas descobertas e previsões para o futuro.

Quem deve assistir

Os Seminários destinam-se a superiores, quadros intermédios e gestores. O treinamento universitário será útil mas não é indispensável para a frequência destes Seminários. Todas as pessoas que queiram frequentar estes seminários devem estar familiarizadas com os processos de fabrico da indústria têxtil. Estes Seminários serão úteis a todas as empresas que trabalham com qualquer tipo de fibras.

Custos

A inscrição e frequência dos Seminários serão gratuitas. A reserva do hotel será feita pelos participantes. As refeições ou qualquer bebida poderão ser tomadas no Instituto, mas mediante pagamento.

PRIMEIRO SEMINÁRIO
NOÇÕES BÁSICAS SOBRE NÃO TECIDOS
16 e 17 de JUNHO, 1981

PROGRAMA

TERÇA FEIRA, 16 de JUNHO de 1981	
9.30	Abertura Prof. Doutor C. N. Panson Morgado, Reitor do Instituto Universitário da Beira Interior
9.45	Introdução e aspectos globais Maria José Geraldes (Monitora do IURI)
10.30	Machinery and Methods Used in Nonwoven Manufacture Dr. Hassan Behery (AID Advisor)
11.15	Intervalo
11.30	Web Formation Dr. Hassan Behery (AID Advisor)
12.15	Almoço
14.00	Web - laid Nonwovens Dr. Hassan Behery (AID Advisor)
14.15	Ligantes usados na fabrica de Não Tecidos Dr. Maria Isabel Ferra (Co-fundadora do IURI)
15.30	Intervalo
16.00	Adheseivo - Bonded Nonwoven Fabrica Dr. Hassan Behery (AID Advisor)
16.30	Encerramento
QUARTA FEIRA, 17 de JUNHO de 1981	
9.30	Não Tecidos ligados mecnicamente José Lucas (Monitor do IURI)
10.15	Spunlaced Nonwoven Fabrica Dr. Hassan Behery (AID Advisor)
11.00	Intervalo
11.15	Aplicação de Não Tecidos Maria José Geraldes (Monitora do IURI)
12.00	Almoço
14.00	O futuro económico dos Não Tecidos Dr. António Marques Freixo (Assistente IURI)
14.45	Almoço na Nonwoven Fabrica Dr. Hassan Behery (AID Advisor)
16.30	Encerramento

ALOJAMENTOS

Por favor reserve o seu hotel.
Algumas sugestões:

QUARTO DUPLO

Com Banho

Pensão Solneve	6.5\$00
Residencial Montalto	-
Residencial Floresta	600\$00
Varanda dos Carqueijais	1.600\$00

QUARTO SIMPLES

Com Banho

Pensão Solneve	440\$00
Residencial Montalto	695\$00
Residencial Floresta	300\$00
Varanda dos Carqueijais	1.100\$00

.corte, preencha e devolva)

Ficha de Inscrição

Para assistir ao(s) Seminário(s) agradecemos que preencha correctamente as informações
que se seguem e remeta para o seguinte endereço:

Instituto Universitário da Beira Interior
Gabinete do Prof. Hassan Behery
R. Marques d'Ávila e Bolalva

6200 COVILHÃ CODEX

Nome: _____

Função _____

Organismo/Empresa _____

Direcção _____

Telefone _____

Eu gostaria de assistir:

Primeiro _____ Segundo _____ Terceiro _____ Seminário _____



Ministério da Educação e Cultura
SECRETARIA DE EDUCAÇÃO SUPERIOR

INSTITUTO UNIVERSITÁRIO DA BARRA INTERIOR

Rua Nuno Álvares Pereira, 100 - Barra e Vila Rica
Telef. 22141/2
8210 - Vila Rica

Bem-vindos aos Seminários

SEGUNDO SEMINÁRIO
sobre

NÃO-TECIDOS

(nonwovens)

Assistentes do IUBI, técnicos especialistas do Instituto dos Têxteis e consultores do programa AID farão a apresentação e conduzirão as discussões sobre o rápido crescimento desta nova tecnologia.

-23-

ATTACHMENT 6 (Cont.)

PROGRAMA

Primeiro Seminário:

NOÇÕES BÁSICAS SOBRE NÃO-TECIDOS

Data: 16 e 17 de Junho, 1981

Segundo Seminário:

PROGRESSO DOS NÃO-TECIDOS

Data:

(24 e 25 de Junho, 1981)

Terceiro Seminário:

ÚLTIMAS INOVAÇÕES

E

FUTURO DOS NÃO-TECIDOS

Data:

(1 e 2 de Julho, 1981)

Os Seminários

Língua

Os Seminários serão dados parte em Inglês e parte em Português. Os assistentes do IUBI participantes poderão fazer um resumo em Português das exposições quando se julgar necessário.

Temas

Os temas discutidos nestes Seminários tratarão de noções básicas sobre Não Tecidos: processos de fabrico, utilização de produtos, ensaios e tendências económicas e outras. Este curso interessará a todas as pessoas que queiram inteirar-se do rápido crescimento desta tecnologia na Indústria Têxtil.

Estes três Seminários cobrirão as noções básicas da tecnologia dos Não Tecidos, dando aos participantes os conhecimentos necessários. O segundo seminário versará sobre o progresso que esta indústria sofreu nos últimos 10 anos. No terceiro e último Seminário, falar-se-á sobre as últimas descobertas e previsões para o futuro.

Quem deve assistir

Os Seminários destinam-se a supervisores, quadros intermédios e gestores. O treinamento universitário será útil mas não é indispensável para a frequência destes Seminários. Todas as pessoas que queiram frequentar estes seminários devem estar familiarizadas com os processos de fabrico da Indústria Têxtil. Estes Seminários serão úteis a todas as empresas que trabalhem com qualquer tipo de fibras.

Custos

A inscrição e frequência dos Seminários serão gratuitas. A reserva do hotel será feita pelas participantes. As refeições ou qualquer bebida poderão ser tomadas no Instituto, mas mediante pagamento.

SEGUNDO SEMINÁRIO

EVOLUÇÃO NOS MÃO TECIDOS

24 e 25 de Junho, 1981

PROGRAMA

MODERADOR: ENGR BORGES TERENAS

QUARTA-FEIRA, 24 de JUNHO de 1981

- 14.30 Abertura
Prof. Doutor C. M. Passos Morgado, Reitor do Instituto Universitário da Beira Interior
- 14.45 Tecnologia dos Não-Tecidos
Eng. Vicente Borges Terenas, Director-Delegado do Instituto dos Têxteis na Covilhã
- 15.15 Spunbonded - A Rising Technology
Dr. Hassan Behery (AID Advisor) Clemson Univ.
- 16.00 Intervalo
- 16.15 Métodos de Identificação e Análise dos Não-Tecidos
Maria José Gerales (Monitora do IUBI)
- 16.45 Estrutura e Comportamento Mecânico dos Não-Tecidos Agulhados
José Lucas (Monitor do IUBI)
- 17.15 Encerramento

QUINTA-FEIRA, 25 de JUNHO de 1981

- 14.30 Needling Efficiency of Needle-Punched Nonwovens
Dr. Hassan Behery (AID Advisor), Clemson Univ.
- 15.00 Aplicação dos Não-Tecidos em Geotêxtil
Eng. Portugal Ribeiro - Quimical
- 16.30 Intervalo
- 16.45 Aplicação dos Não-Tecidos no Revestimento de solos
Eng Carlos Manuel Baptista, Director Adjunto da Fábrica de Tapetes Vitória (Mira de Aire)
- 18.00 Encerramento

ALOJAMENTOS

Por favor reserve o seu hotel.

Algumas sugestões:

QUARTO DUPLO
Com banho

Pensão Solneve	615\$00
Residencial Montalto	-
Residencial Floresta	600\$00
Varanda dos Carqueijais	1.600\$00

Quarto Simples
Com Banho

Pensão Solneve	440\$00
Residencial Montalto	695\$00
Residencial Floresta	300\$00
Varanda dos Carqueijais	1.100\$00

(corte, preencha e devolva)

FICHA DE INSCRIÇÃO

Para assistir ao(s) Seminário(s) agradecemos que preencha correctamente as informações que se seguem e remeta para o seguinte endereço:

Instituto Universitário da Beira Interior
Gabinete do Prof. Hassan Behery
Rua Marques d'Ávila e Bolama
6200 COVILHA

Nome: _____

Função: _____

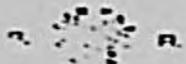
Organismo/Empresa: _____

Direcção: _____

Telefone: _____

Eu gostaria de assistir:

Primeiro : Segundo: _____ Terceiro: _____ Seminário



Ministério da Educação e Ciência
Instituto Universitário da Beira Interior

INSTITUTO UNIVERSITÁRIO DA BEIRA INTERIOR

RUA MADRUGADA, 1514-1
31127-000 COVILHÃ

TERCEIRO SEMINÁRIO
sobre

NÃO-TECIDOS

(nonwovens)

Assistentes do IURI, técnicos especialistas do Instituto dos Têxteis, consultores do programa AID e especialistas da Indústria Privada farão a apresentação e conduzirão as discussões sobre o rápido crescimento desta nova tecnologia.

PROGRAMA

Primeiro Seminário:

NOÇÕES BÁSICAS SOBRE NÃO-TECIDOS

Data:

(16 e 17 de Junho, 1981)

Segundo Seminário:

PROGRESSO DOS NÃO-TECIDOS

Data:

(24 e 25 de Junho, 1981)

Terceiro Seminário:

ÚLTIMAS INOVAÇÕES

E

FUTURO DOS NÃO-TECIDOS

Data:

(2 e 3 de Julho, 1981)

Os Seminários

Língua

Os Seminários terão duas partes em Inglês e parte em Português. Os assistentes do IURI participantes poderão fazer um resumo em Português das exposições quando se julgar necessário.

Temas

Os temas discutidos nestes Seminários tratarão de noções básicas sobre Não Tecidos: processos de fabrico, utilização de produtos, ensaios e tendências económicas e outras. Este curso interessará a todas as pessoas que queiram inteirar-se do rápido crescimento desta tecnologia na Indústria Têxtil.

Estes três Seminários cobrirão as noções básicas da tecnologia dos Não Tecidos, dando aos participantes os conhecimentos necessários. O segundo seminário versará sobre o progresso que esta indústria sofreu nos últimos 10 anos. No terceiro e último Seminário, falar-se-á sobre as últimas descobertas e previsões para o futuro.

Quem deve assistir

Os Seminários destinam-se a supervisores, quadros intermédios e gestores. O treinamento universitário será útil mas não é indispensável para a frequência destes Seminários. Todas as pessoas que queiram frequentar estes seminários devem estar familiarizadas com os processos de fabrico da Indústria Têxtil. Estes Seminários serão úteis a todas as empresas que trabalhem com qualquer tipo de fibras.

Custos

A inscrição e frequência dos Seminários serão gratuitas. A reserva do hotel será feita pelos participantes. As refeições ou qualquer bebida poderão ser tomadas no Instituto, mas mediante pagamento.

ALOJAMENTOS

Por favor reserve o seu hotel.

Algumas sugestões:

QUARTO DUPLO
Com banho

Pensão Solneve	615\$00
Residencial Montalto	-
Residencial Floresta	600\$00
Varanda dos Carqueijais	1.600\$00

Quarto Simples
Com Banho

Pensão Solneve	440\$00
Residencial Montalto	695\$00
Residencial Floresta	300\$00
Varanda dos Carqueijais	1.100\$00

TERCEIRO SEMINÁRIO

PLATEAU DE INOVAÇÃO E ESTUDO DOS NÃO-TECIDOS
2 e 3 de Julho, 1981

PROGRAMA

QUINTA-FEIRA: ENCS BORGES TERENAS

QUINTA-FEIRA, 2 de JULHO de 1981

- 15.00 Abertura
Prof. Doutor C. M. Passos Morgado, Reitor do Instituto Universitário da Beira Interior
- 15.30 A Indústria dos Não-Tecidos em Portugal
Dr. João Lisboa (Professor do IUBI)
- 15.10 Não-Tecidos para Entretelas
Eng. Moura (Eurosputma)
- 16.00 Intervalo
- 16.15 Potentialities of Stitch-Bonded Nonwovens
Dr. Hassan Behery (AID Advisor, Clemson Univ.)
- 17.00 Aplicação dos Não-Tecidos em Geotêxtil
Eng. Portugal Ribeiro - Quimigal
- 18.00 Encerramento

SEXTA-FEIRA, 3 de JULHO de 1981

- 9.00 Identificação e controle de Qualidade dos Não-Tecidos
Maria José Geraldes (Monitora do IUBI)
- 10.00 Aspectos Físico-Químicos dos Ligantes
Dra. Orvide Pombó (Instituto dos Têxteis)
- 11.00 Intervalo
- 11.15 Estrutura e Comportamento Mecânico dos Não-Tecidos Agulhados
José Lucas (Monitor do IUBI)
- 11.45 Physical Properties of Stitch-Bonded Nonwovens
Dr. Hassan Behery (AID Advisor, Clemson Univ.)
- 12.30 Encerramento

(corte, preencha e devolva)

FICHA DE INSCRIÇÃO

Para assistir ao(s) Seminário(s) agradecemos que preencha correctamente as informações que se seguem e remeta para o seguinte endereço:

Instituto Universitário da Beira Interior
Gabinete do Prof. Hassan Behery
Rua Marquês d'Ávila e Bolama
6200 COVILHA

Nome: _____

Função: _____

Organismo/Empresa: _____

Direcção: _____

Telefone: _____

Eu gostaria de assistir:

Primeiro: Segundo: Terceiro: Seminário: _____



Instituto Universitário de Beira Interior

Nonwovens - Companies

- | | |
|--|---|
| <p>1) Fanafel filtros, feltros
Estrada de S. João
3880 OVAR Telef: 52091</p> | <p>9) Renova não-tecidos(wet process)
Fábrica de papel do Almonda
2350 TORRES NOVAS Telef:23174</p> |
| <p>2) Fábrica de Tapetes Vitória
alcatifa industrial,feltros div.
2482 PORTO DE MÓS
Mira de Aire Telef:044-44408/9</p> | <p>10) Lusotufa alcatifas
3882 OVAR Telef: 72005</p> |
| <p>3) IPetex alcatifa
Fabricantes de alcatifas
179, Augusto Lessa
4200 PORTO Telef: 496742</p> | <p>11) Unitape
Apartado 9 Esmoriz
3880 OVAR Telef: 73011/2</p> |
| <p>4) Maitex alcatifas e revestimentos
Rodrigo G. Lage - Águas Santas
4470 MAIA Telef: 901420</p> | <p>12) Eurospuma
Espinho</p> |
| <p>5) Fáb. de Alcatifas de Lousã alcatifas
R. Combatentes Grande Guerra
3200 LOUSÃ Telef: 99263</p> | |
| <p>6) Vitocar pastas para colchão
Rechousa - Vila Nova de Gaia
Telef: 913070</p> | |
| <p>7) Pastofo pastas para colchão e estofos
Maganha - S. Tiago Bougado
3750 TROFA Telef:42759</p> | |
| <p>8) Quimigal
Av. Infante Santo, 2 - 29
1300 LISBOA</p> | |

ACCOMPLISHMENTS DURING THE ADVISORY PERIOD

STUDY ON RHEOLOGY

3. STUDY OF RHEOLOGY

The activity previously performed at Clemson, in the area of rheology through the high speed spinning seminar organized by Dr. Behery in 1975, was discussed with Reitor Morgado. Papers presented at this seminar were also shown to Reitor Morgado. It was then decided that two short-term advisors should be invited. One advisor will be invited to present the subject on rheology, and the other to discuss fiber and textile physics.

Dr. Edie of the Chemical Engineering Department at Clemson was mentioned as a possible candidate for a short-term advisor on rheology. A short resume of Dr. Edie was available and presented to Reitor Morgado. He agreed to extend an invitation to Dr. Edie.

The following publications and references on rheology were prepared by Dr. Behery and presented to Reitor Morgado:

1. Edie, D. D., "Polymer Distribution", Fiber Producer, pp. 42-46, April, 1978.
2. Perepelkin, K. E., "The Structural Factor in the Orientation Processes of Fibers and Films of Flexible- and Rigid-Chain Polymers", Plenum Publishing Corporation, 0015-0541/77/0904-0320, 1978.
3. Park, J. B., K. L. Devries, and W. O. Statton, "Chain Rupture during Tensile Deformation of Nylon 6 Fibers", J. Macromol.Sci.-Phys., B15 (2), pp. 205-227, 1978.

4. Park, J. B., K. L. Devries, and W. O. Statton, "Structure Changes Caused by Strain Annealing of Nylon 6 Fibers", J. Macromol.Sci.-Phys., B15(2), pp. 229-256, 1978.
5. Devries, K. L., W. O. Statton, J. B. Park, "Shrinkage Influenced by Chain Rupture During Tensile Deformation", J.Macromol.Sci.-Phys., B15(3), pp. 409-420, 1978.
6. Keller, A, "Polymer Crystals", Reports on Progress in Physics, Vol. XXXI, Part 2, p. 623, 1968.
7. Kim Jung Bu, S. Dumitriu and CB. I. Simionescu, "Grafting of Vinylic and Dienic Monomers Onto Viscose Cord Fibres, III. Mechanical Properties of Grafted Fibres with Acrylonitrile and Isoprene", Cellulose Chemistry and Technology, 11, pp. 655-660, 1977.
8. Serkov, A. T. and O. A. Khanchich, "Formation of Oriented Structures in the Precipitation of Polymers from Concentrated Solutions", Translated from Khimicheski Volokna, No. 4, pp. 12-16, July-August, 1977.
9. Bykova, I. N. and A. B. Pakshver, "Influence of Optical Brighteners on the Spinning Process and Properties of Polyamide and Polyester Fibres", Translated from Khimicheskie Volokna, No. 4, pp. 26-28, July-August, 1977.

10. Bykova, I. N. and A. B. Pakshver, "Stability of Optical Brighteners in the Synthesis of Polycaproamide and Polyethylene Terephthalate", Translated from *Khimicheskie Volokna*, No. 3, pp. 40-41, 1977.
11. Holt, N. L. and I. Finnie, "Final Report on Fracture and Fatigue of High Strength Filaments", California University, Berkeley, pp. 107, 1976.
12. Makarewicz, P. J. and G. L. Wilkes, "Structural Rearrangements in the Liquid-Induced Crystallization of Cold-Drawn Poly(Ethylene Terephthalate)", *Textile Research Journal*, pp. 136-143, March, 1978.
13. Statton, W. O., "I. Fiber Structure; II. Melt Rheology, Spinning and Take-up; III. Physical and Mechanical Properties of Fiber", Papers presented at "High Speed Spinning Conference" held at Clemson University, 1975.

ACCOMPLISHMENTS DURING THE ADVISORY PERIOD

COORDINATION OF CLEMSON'S PART

4. COORDINATION OF CLEMSON'S PART

A. Color Science Program

A memorandum prepared by Professor F. T. Simon for a proposal to teach color science at Covilha, Portugal was presented to Reitor Morgado. A copy of this letter is shown in Attachment 8. He was highly impressed with the idea of the formation of a color center. The bulletin and instructions of the equipment that Professor Simon will be bringing to Covilha was also given to Reitor Morgado. This consisted of the very latest spectrophotometer and computer, a Matchmate 3000 system. At this point, it was brought to the attention of the Reitor that the Institute had already ordered the ACS-500 System for control and reproduction of color. Also, there was some misunderstanding by Reitor Morgado about the travel arrangements of Professor Simon. The concept at that point was that Professor Simon, after being in Europe and on his way home, would stop at Covilha with the equipment costing the IUBI almost nothing as far as travel expenses are concerned. Only on this basis had they previously agreed to invite him. When the actual situation of the travel arrangements was discussed and presented in detail, Reitor Morgado decided to postpone Professor Simon's visit to a later date. This was done in order to be able to assign a counterpart and allow time for the receipt of the equipment

on order, so that Professor Simon's visit will be more useful and effective.

B. Energy Conservation and Treatment of Textile Effluents

The visit of Dr. J. J. Porter was discussed and his area of activity was presented. Also, the availability of other consulting firms that have done extensive work in research, design, and execution of projects on effluent treatment in textile mills was explained. The idea of inviting a short-term advisor for four months was also studied in light of previous experience. As a result, it was suggested that a committee from IUBI be invited to come to the U.S.A. This committee should include three members:

- i. an engineer (either mechanical or electrical)
- ii. a chemist, chemical engineer, or textile chemist, and
- iii. a physicist.

This committee will meet with faculty at Clemson University, and several other universities who are actively involved in energy conservation or conversion research. Also, the committee will meet with consultants and engineering firms who have carried out design and execution of energy projects. The specific area or areas which the committee will be interested in must be outlined prior to their arrival so that the proper itinerary can be planned. Upon completing their visit and returning back to Covilha, the committee can

present a report to the Reitor. Accordingly, the Reitor can decide the specific area of activity in the energy field which he would like to invite a short-term advisor.

The above proposal has been accepted by Reitor Morgado and further action will be taken to perform it.

Reitor Morgado also requested copies of several references on energy research. These were obtained and delivered to him. A list of these references is shown in Attachment 9.

C. Schedule of Visits of Short-term Advisors

Reitor Morgado prepared a list of several specific topics under the major classifications, which represent the most important needs by IUBI. Short-term advisors were requested to come to Covilha and consult on these topics. The table shown in Attachment 10 was prepared which shows the topics, the year in which the visit of the short-term advisor is expected, the number of months for the duration of the visit, the tentative date, and a suggested name of the advisor.

Due to discussion over the three programs which are available, namely:

- i. a program according to the latest proposal by Dr. Collom,
- ii. a program according to the sub-contract between Clemson and Purdue, and
- iii. a program according to the original proposal,

Reitor Morgado requested a comparison be made between these programs. This was necessary in order to be able to visualize any significant difference, specifically for the part to be carried out by Clemson. This comparison was made by the construction of the table shown in Attachment 11. It is obvious that in the textile area, no difference is observed between the schedule in the sub-contract and the latest proposal.

College of Industrial Management and Textile Science

DEPARTMENT OF TEXTILES



MEMORANDUM

TO: Hassan M. Behery
FROM: Fred Simon *FTS*
DATE: April 22, 1981
SUBJECT: Proposal to Teach Color Science at Covilha, Portugal

This is a proposal to provide training in the field of Color Science at the University of Covilha in Portugal. The principal trainer will be Professor Frederick T. Simon who is the J. E. Serrine Professor in Textile Science at Clemson University. The plan put forward here consists of several parts and is projected to take place in October and November, 1981. The particular reason for this time is that some special color measuring equipment will be on exhibit in Europe just prior to that period and can be made available for use in October in Covilha.

The general idea of this cooperation is to work toward setting up a Color Science Center at the University of Covilha which will serve as a center of expertise for the textile industry in Portugal. In order to accomplish this, we think that a practical exhibit of color technology can be obtained and installed in a special location at the University that will serve as a focus for the formation of a center. Examples of these visual displays would be: 1) a series of charts published by van Nostrand; 2) a display of the Munsell system; 3) a series of colorant primaries portraying concentration ladders and color matches.

The second part of the endeavor is connected with the opportunity to have the very latest spectrophotometer and computer, a Match-mate 3000 system, in Covilha. It will be exhibited at the International Color Association meeting in Berlin on September 18-25, 1981, by Diano Corporation of the United States. They have agreed to have it diverted to Portugal on its way back to the United States, provided some help is given with the shipping cost. This will provide the equipment for teaching at Covilha and demonstration to the local industry. This is an unusual opportunity which could not be accomplished at any other time.

ATTACHMENT 8 (Cont.)

Hassan Behery
Page Two
April 22, 1981

The training function is envisioned as having a two-fold objective. One type of instruction would be geared to the training of faculty and advanced students at the University. This would consist of about 15 lectures and five demonstration laboratories over a five week period. Only the simplest chemical laboratory equipment is required to do dyeing and to prepare solutions. The spectrophotometer is only needed for part of this time, because some of the instruction only requires visual aids which will come from Clemson or will be prepared by the students. The other instruction would be in the form of a seminar for industry technicians and management. This would be several days in length and could have some invited speakers from other countries who have expert knowledge in the field of color. Arrangements could be made from here for these speakers.

The remaining part of this program is to leave in Covilha enough demonstration equipment, referral books, and projection slides so that the nucleus of an instructor facility will be available even if specialized talent is not developed among the teaching staff there.

vc

ATTACHMENT 9

REFERENCES ON ENERGY
PRESENTED TO REITOR MORGADO

1. "Wood as an Alternate Source of Energy in a Textile Finishing Plant"
Ernest B. Rogers, Jr.
The Clemson University Review of Industrial Management and Textile Science, Volume XVIII, No. 2, p. 85, (Fall, 1979)
2. "Complete Re-Use of Textile Dyeing Wastes Processed With Dynamic Membrane Hyperfiltration"
C. A. Brandon, J. S. Johnson, R. E. Minturn, and J. J. Porter
The American Society of Mechanical Engineer Publication No. 72-PID-3
3. "Water, Energy and Chemical Recovery From Desizing"
J. J. Porter and Denny E. Black
American Dyestuff Reporter, p. 46, (December, 1979)
4. "Hyperfiltration Pilot Plant for Textile Wastewater Renovation"
Craig A. Brandon, Ali El-Nasher, and J. J. Porter
American Dyestuff Reporter, p. 20, (October, 1975)
5. "Textile Waste Treatment Today and Tomorrow"
John Porter, William F. Nolan, and A. Ray Abernathy
Chemical Engineering Symposium Series, Water, Vol. 67, No. 107, p. 471, (1970)
6. "Water Uses and Wastes in the Textile Industry"
John J. Porter, Donald W. Lyons, and William F. Nolan
Environmental Science & Technology, American Chemical Society, Vol. 6, No. 1, p. 36, (January, 1972)
7. "Ozone Destruction of Selected Dyes in Wastewater"
Eric H. Snider and John J. Porter
American Dyestuff Reporter, p. 36, (August, 1974)
8. "A Review of Bat Effluent Guidelines for the Textile Industry"
John J. Porter and Grant A. Goodman
Paper Presented at P. D. Seminar, Clemson University, p. 20, (1979)
(Source: Federal Register, Vol. 44, No. 210, pp. 62204-62241, October, 1979)
9. "Source Testing to Determine Emission Compliance for Volatile Organic Compounds"
Grant A. Goodman and John J. Porter
American Dyestuff Reporter, p. 36, (February, 1980)
10. "An Evaluation of the Potential for Energy Conservation, Chemical Recovery and Wastewater Recycle Associated with Continuous Dyeing"
J. Leo Gaddis, Craig A. Brandon, and John J. Porter

Report submitted to the U. S. Environmental Protection Agency under
EPA Grant No. R803875 (2 parts)

11. "Treatment of Textile Waste With Activated Carbon"
John J. Porter
American Dyestuff Reporter, p. 24, (August, 1972)
12. "Water Quality Requirements for Reuse in Textile Dyeing Processes"
Grant A. Goodman and John J. Porter
American Dyestuff Reporter, p. 33, (October, 1980)
13. "Long-term Biodegradability of Textile Chemicals"
John J. Porter and Eric H. Snider
Journal WPCF, p. 2198, Vol. 48, No. 9 (September, 1976)
14. "The Characterization, Recovery and Re-Use of Textile Dyeing and
Finishing Waste Streams"
John J. Porter and Denny E. Black

SCHEDULE OF VISITS OF SHORT-TERM ADVISORS
FROM CLEMSON UNIVERSITY

Topic	Year	Mo.	Dates	Name
GROUP A: <u>Technologia E Gestão Textile</u> (Textile Technology)				
1. Organização da Produção Textile (Organization of Textile Products)	1	5	1/01-1/31/81* 2/10-5/30/81	LaRoche LaRoche
2. Não Tecidos (Nonwovens)	1	2	5/15-7/15/81	Behery
3. Instrumentação e Control (Instruments for Textile Control)	3	2	---	---
GROUP B: <u>Física Textil</u> (Textile Physics)				
4. Fiber & Textile Physics**	2	2	5/15-7/15/82	Behery
5. Reologia Têxtil (Rheology)	2	2	2/15-4/15/82	Edie
6. Ciência da Cor (Color Science)	3	2	---	---

* One month was spent at Clemson for preparation for the program

**

four months originally assigned for color science

Topic	Year	Mo.	Dates	Names
GROUP C: Quimica Têxtil (Textile Chemistry)				
7. Química Física dos Polímeros (Physical Chemistry of Polymers)	3	2	---	---
8. Química da Degradação das Fibras (Chemical Degradation of Fibers)	3	2	---	---
9. Tratamento de Efluentes (Effluent Treatment)	4	3	---	---
GROUP D: Outros Assuntos (Other Topics)				
10. Conservação da Energia da Indústria Têxtil (Conservation of Energy in Textile Industry)	2	4	2 months (Committee) { 2 months (Advisor)	
11. Management	-	4	---	---
TOTALS				
	1	7		
	2	8		
	3	8		
	4	3+4		
GRAND TOTAL				
		30		

TABLE 3

SUMMARY OF PROJECT INPUTS TO TUBI

Technical Assistance and Training by Areas of Activity (TA in Portugal; TP in United States)	ACCORDING TO LATEST PROPOSAL (COLLON)					ACCORDING TO SUB-CONTRACT BETWEEN C.U. & PURDUE					ACCORDING TO ORIGINAL PROPOSAL					
	Person Months by Project Year					Person Months by Project Year					Person Months by Project Year					
	1	2	3	4	Total	1	2	3	4	Total	1	2	3	4	Total	
D. <u>Agribusiness Management</u> (Continued)																
3. Training																
a. Activity planning	4	--	--	--	4						--	3	3	3	9	
E. <u>Textile Technology & Management</u>																
1. Short-term Advisors																
a. Organization and management of production	4	--	--	--	4	} 5	--	3	--	8	} 2	2	2	3	9	
b. Instruments and control	--	2	--	2	4											
2. Training																
a. Organization and management of production	--	--	4	--	4	} --	4	4	--	8	} 6	12	3	3	24	
b. Non-woven fabrics	--	--	--	4	4											
F. <u>Textile Physics</u>																
1. Short-term Advisors																
a. Color science	--	--	2	2	4	} 2	2	2	--	6	} 3	3	--	--	6	
b. Rheology (mechanical preparation of fiber and textiles)	2	--	--	--	2											
2. Training																
a. Color science	--	2	--	--	2	} --	2	--	2	4	} 3	3	--	--	6	
b. Rheology	--	--	--	2	2											
G. <u>Textile Chemistry</u>																
1. Short-term Advisors																
a. Effluent treatment	--	--	3	--	3	} --	4	--	3	7	} 3	3	3	--	9	
b. Polymer Chem/Phy	--	4	--	--	4											
2. Training																
a. Effluent treatment	--	--	--	4	4	} 2	--	4	--	6	} --	6	--	--	6	
b. Polymer Chem/Phy (HS Program)	--	--	12	6	18											
c. Chemistry of fiber deterioration	--	2	--	--	2											
H. <u>Other Areas</u>																
1. Short-term Advisors																
a. Energy conservation	--	--	--	3	3											
TOTALS:																
1. Long-term advisors (1 advisor)	11	12	1		24											
2. Short-term advisors (15 advisors)	9	16	10	10	45	7	9	8	--	--	10	12	2	--	24	
Total (16 advisors)	20	28	11	10	69	7	9	8	6	30	15	15	6	3	39	
									6	30	10	8	3	63	7	

TABLE 3

SUMMARY OF PROJECT INPUTS TO

Technical Assistance and Training by Areas of Activity (TA in Portugal; IR in United States)	IUBI ACCORDING TO LATEST PROPOSAL (COLLON)					ACCORDING TO SUB-CONTRACT BETWEEN C.U. & PURDUE						ACCORDING TO ORIGINAL PROPOSAL					
	Person Months by Project Year					Person Months by Project Year						Person Months by Project Year					
	1	2	3	4	Total	1	2	3	4	Total		1	2	3	4	Total	
TOTALS: (Continued)																	
3. Training																	
a. Long-term (3 trainees)		18	30	6	54	--	6	12	--	18	1	--	12	--	--	12	1
b. Short-term (13 trainees)	14	11	12	14	51	2	6	11	2	21	7	18	18	6	9	51	13
Total (16 trainees)	14	29	42	20	105	2	12	23	2	39	8	18	30	6	9	63	14

ACCOMPLISHMENTS DURING THE ADVISORY PERIOD

OTHER ACTIVITIES

5. Other Activities

A. Textile Physics and Technology Seminar

Upon request by Reitor Morgado, three seminars on Textile Physics and Technology were organized. The topics, speakers, and dates of these seminars were:

- i. "Parallelism of Fibers During Combing and Spinning Preparation" (In Portuguese)

Speaker: Eng. Santos Silva

Date: Tuesday, June 30, 1981, 9:30 p.m.

- ii. "Fiber Migration:

Speaker: Dr. Hassan M. Behery

Date: Monday, July 6, 1981, 9:30 p.m.

- iii. "Problems in Blends"

Speaker: Dr. Hassan M. Behery

Date: Friday, July 10, 1981, 9:30 p.m.

An announcement for each seminar was prepared in Portuguese and distributed by mail and also during the nonwoven seminars. The attendance was reasonable for the first two seminars, and was very good for the third one as the topic was of great interest. The third seminar lasted until midnight.

Also, the participation of one of IUBI's faculty members as a speaker in these seminars was favorably accepted by Reitor Morgado.

B. Paper Co-Authored for Publication

An outline was made for a paper to be presented for publication by Reitor Morgado and Dr. Behery as co-authors. The title of the paper is, "Simplified Theory on the Strength of Blended Yarn." The paper was first written in English and was then re-written in Portuguese. It is presented for publication in the Folhatextil magazine, published by Instituto Dos Texteis, Lisboa, Portugal. The English version of this paper is given in Attachment 13.

C. Assistance in Receiving New Equipment

A list of the new equipment was obtained for studying the types of equipment which will be available in the future at the Institute. (This list is available upon request, and is not included in this report as it contains 29 pages). This will help in planning and organizing the activities of the short-term advisors on instrumentation.

Some of this equipment has already been received by the Institute and assistance was given to install and start some of it.

D. Visits to Local Industry

Plans were made to visit several textile mills. The purpose of the visits were to have a general idea about the local industry, and also provide advice for improvements. However, all remarks and comments were to be made to IUBI and then conveyed to the industry.

The visits were organized by Professor José Miquel Fiadeiro, who also acted as my host and counterpart in project coordination.

The textile industry in Portugal is almost regional. About 70 to 80% of the industry deals with cotton and cotton blends, and is concentrated in northern Portugal around Porto. Only 20-30% of the industry is engaged in wool and wool blends. Covilha is considered the center of woolen and worsted production. It represents about 80% of the wool industry in Portugal. There are more than 100 mills which vary from small to large, and modern to old. All the industry in Covilha is private with the exception of one large mill, which is half privately owned and half publically owned as one of the banks owns its half for financial reasons.

Approximately 60% of the wool and worsted products are for export, and only 40% are for local consumption.

The following textile plants were visited:

1. CIL-COMPLEXO INDUSTRIAL DE LANIFICIOS
2. FIPER CO.
3. Dyeing Plant of CIL Company
4. PENTEADORA
5. NOVA PENTIA GAO
6. The Textile Institute Section at Covilha

The following is a brief summary about each of the above mills together with a few personal technical remarks.

1. CIL-COMPLEXO INDUSTRIAL DE LANIFICIOS

Mr. Manuel Rogerio Mesquita Nunes - Director

This is a family-owned mill which produces one million meters per year. The company produces its own carded/woolen yarn, but contracts its combed worsted yarn. They produce mens and womens suiting material, ranging in weight from 200 to 800 g/meter.

The total production constitutes about 70% woolen and 30% worsted. Of the worsted material, 60% is of 100% wool, and 40% is of blends of wool and polyester. The popular blends are 55/45 and 75/25 polyester/wool. They import wool tops from Australia as well as greese wool. There is no tax on greese wool. The tax on wool top is 10%, but some of it is reimbursed when material is reexported. They claim that the quality of their worsted fabrics is about the same as English worsted. My personal judgement is that the dyeing and finishing of the fabric is below the British quality. In discussing the status of export activities to the United States, it has been indicated that they would like to begin export procedures with the U.S., but due to complicated market practices and quality standards requested and implemented by export brokers (or middle men) they simply cannot comply with it. I also can foresee quality problems if exportation were to take place with the United States.

One of the general observations is poor material handling. The place of the raw stock to be fed to the card is about 60 meters from the feed end of the card. The material is transferred by air ducts. This is not a favorable practice for such long distances. The yarn handling needs to be improved. The waste percentage is considerably high. The housekeeping is below acceptable levels by American Mill Standards. OSHA would have a lot of sayings if they were to pass through the mill. The mill produces their own special design which they are proud of, and also tries to keep up with the latest style. I have seen stretch flannel fabric, which will be the fashion of 1982. It is produced from 99% wool and 1% Lyera. It is one-way stretch (warp direction). The Lyera is added to the yarn as continuous monofilament on the spinning frame. This is the same method used in the United States.

2. FIPER COMPANY

Mr. Saraiva - General Manager

Mr. Gouveia - Financial Manager

Mr. Rainha - Technical Manager

This is a spinning mill with 6500 spindles. It employs 180 workers and 4 technicians for the three shifts. There are several types of machines from Germany, France, and also the Saco-Lowell (USA) Rovomatic. The varieties of machinery used in each mill was one of the major observations.

3. Dyeing Plant of CIL Company

The finishing plant of CIL Company was also visited. The dye house handles fiber dyeing in forms of tops, yarn dyeing in skeins and packages, and fabric dyeing in open and pressure dyeing. The capacity is 2 million tons of yarn per year. This is four times the production of their own spinning plant. They also dye and finish 1 1/2 million meters of fabric. One million meters are for CIL's own production, and the excess in capacity for yarns and fabrics is for commission dyeing.

This is the oldest and largest dyeing plant in Covilha, and they carry out 200 colors per day. Their consumption of fuel is 800,000 kg/year.

4. PENTEADORA

Eng. Mario Tarouca - General Technical Manager

The plant has 18,000 spindles, mostly engaged in the blend of 55/45 polyester/wool blends. The yarn size produced ranges from 1/25's to 1/50's, with the majority in the range of 1/40's. The total production is 4,000 to 5,000 kg/day. The spinning section works 2 shifts, the weaving 3 shifts, and the dyeing and finishing 2 shifts. They also have an apparel section located in Lisbon for cutting and sewing, and this section works only one shift.

The weaving section has 100 looms. They are all of the shuttleless type, which is the latest technology in weaving. Some of these looms were made in Spain by Liscence from Picanol.

The production of this company is mainly for export to Europe, as high as 80%, and only 20% of the production is for local consumption.

The finishing section of this plant is fairly new, only 2 years old. The machinery is up-to-date in technology. They process between 10-12,000 meters/day, depending on the type and weight of the fabric.

5. NOVA PENTIAGÃO

Dr. João Almzida - Financial Manager

This is the most modern and largest mill in Covilha. It is part of a very large project that was originally planned before the April 25, 1974 revolution. The project started according to the original plan. The building, air-conditioning system, and the labor facilities were most up-to-date. The working conditions and mill organization is by far the best of any other mill. The original plan was to be carried by five families, which still own most of the shares in the company.

The mill's major activity is in wool, acrylic, and wool/acrylic blends. They buy pre-washed wool and perform their own top manufacturing process. The spinning section has 46 machines with 20,000 spindles.

They produce 4,000 kg/day and work only 2 shifts. The yarn size ranges between 2/34, 2/38, 2/40 and 2/49. The company has 14 winding machines and 19 twisters. Five of these twisters are the Allma two-for-one twister, which is of the latest technology. They also have 5 sectional warpers, 60 Sulzer shuttleless looms, and 40 conventional shuttle looms. The company has a very high energy consumption of about \$250,000/month due to the central air-conditioning of the whole plant.

6. The Textile Institute

Eng. Vicente Borges Terenas - Director

Dr. Mário Tavares

Dr. Orvide Pombo

The Textile Institute does most of the testing for the industry. This includes chemical testing, colorfastness against light and washing, and knitting shrinkage against washing. The Institute is moderately equipped and can perform the necessary and fundamental tests for characterization of fibers, yarns, and fabrics. The following is a summary of equipment available at the Institute:

- Microscopes (Projectina) for measuring fiber diameter and fiber cross-sectional areas;
- New model of Uster (Uster II) which is to measure tops, roving, and yarn uniformity (there is also an old model, which is presently not operational);

- Several pendulum-type strength testers for measuring yarn strength and elongation;
- WIRA (Wool Industry Research Association) fiber length and fineness apparatus;
- Almeter automatic length distribution apparatus;
- Uster Cotton length comb sorter;
- Twist tester for measuring yarn twist;
- ICI (Imperial Chemical Industries) tumble box for measuring fabric abrasion;
- Burst-Strength tester (diaphragm-type) for measuring the bursting strength tester (diaphragm is needed).

They also analyze defects in fabrics and try to determine the causes of these defects.

The building has two floors of storage space which is used to store raw materials for the industry against a fee. Also, facilities for determining the moisture regain in the raw stock are available for the industry.

The total manpower is 30 persons, the majority female, and three key personnel. They claim that they are in great shortage of personnel and funds, and training seems to be badly needed, especially since they are preparing a new location for the chemical tests.

Also, they pointed out that sometimes they run into difficulty when testing fibers on the Instron-Tensile testing machine due to excessive vibration.

The personnel of the Institute are also helping in teaching textile courses at IUBI as part-time faculty.

Also, due to the renovation of the building at IUBI, the new equipment that arrives at Covilha will be situated at the Institute until the laboratory space at IUBI is available.

E. Students' Field Trip

During the first seminars on nonwovens, one of the participants, Eng. Carlos Manuel Batista, was a joint director of the Fabrica de Tapetes Vitoria. This company is involved in the production of nonwoven carpets. He extended an invitation to visit his plant. Seven students, two faculty members, and I visited this plant. The students had a good opportunity to see this technology in action as this was their first plant visit to see nonwoven production. Eng. Batista participated in the second and third seminars as a speaker and also helped in the translation of all my presentations by direct translation. He helped in creating a very strong link between the nonwoven industry and the IUBI.

F. Private Consultancy

During attending one of the nonwoven seminars, Mr. Eurico Fino P. Nino requested private consultancy regarding starting a new nonwoven plant. This was carried out by arrangement with Reitor Morgado. The project was mainly directed towards installing two Mailmo machines. The appropriate advice was given and the decision will be made by the personnel involved. In fact, the

presentation given in the third seminar was mainly directed toward this activity.

G. Reference to Avelino Morgado

Dr. Avelino Morgado is conducting advanced research work in physics. He requested some references that are not published in journals or magazines. These are shown in Attachment 14. Two of these references have already been mailed to him. The others will be mailed as soon as they are obtained.

H. Seminars Attended

Three seminars were attended. One seminar was given by Dr. Michel Averous (Director, Centre de Recherche Meconique Appliqués au Textile, Mulhouse Cedex, France). He gave two lectures in this seminar. One lecture was on "Productivity and Quality of Preparation of Drafting of Long Fibers", and the second lecture was on "Tendencies in the Developments in Machines for Processing Long Fibers". The invitation for this seminar is given in Attachment 15. The lectures were in French and lasted for 2 hours each. There were many instances when the French-made machinery was presented with their full advantages and also in a more favorable way. I learned later that all invited speakers from France are fully supported by the French Government as a kind of cooperation between France and Portugal.

Another seminar was attended which was presented by Armstrong Rubber Company, concerning the drafting roll covers, but this was simply a salesman presentation. However, it was very useful for the attendees from the industry.

A third seminar was also organized by two French faculty from the School of Business Administration in Lyon. The seminar was quite unique as they were presenting a new method for technology transfer. This was developed after a study was made in France which involved locating production plants that would like to provide liaison and know-how to small workshops in Portugal. They prepared a special catalog in which the different companies were classified according to their type of product. Before presenting this information in the seminar, they went around and visited several of the local workshops to discuss the possibility of starting a contact with any of the French firms. I attended two of these visits with them by invitation of the host faculty member at IUBI.



Instituto Universitário de Beira Interior

"S E M I N Á R I O S"

FISICA E TECNOLOGIA TÊXTIL

Horário: 21H30 - 22H30

1ª - TERÇA - FEIRA - 30 de JUNHO 1981

TEMA: PARALELISMO DE FIBRAS NA PENTEÇÃO E FIAÇÃO DE FIBRAS LONGAS

ORADOR: ENGº SANTOS SILVA

LOCAL: IUBI

2ª - SEGUNDA - FEIRA - 6 de JULHO 1981

TEMA: MIGRAÇÃO DE FIBRAS

(FIBER MIGRATION) (EM INGLÊS)

ORADOR: DR. HASSAN BEHERY

AID - Adviser at IUBI

Prof. Clenson University

LOCAL: IUBI

3ª - SEXTA - FEIRA - 10 July 1981

TEMA: PROBLEMAS EM MISTURAS

(PROBLEMS IN BLENDS) (EM INGLÊS)

ORADOR: DR HASSAN BEHERY

AID - Adviser at IUBI

Prof. Clenson University

LOCAL: IUBI

ATTACHMENT 13

SIMPLIFIED THEORY ON THE STRENGTH
OF BLENDED YARN

Dr. Prof. H. M. Behery* and Dr. Prof. Morgaño**

INTRODUCTION

The subject of the strength of blended yarns has received a good deal of attention by both scientists and industrial technologists. Very elaborate theories have been introduced; also, experimental results have been published. Some theories only explain one type of yarn behavior and fail to explain others. The studies on the tensile rupture of blended yarn by Backer (1) and his coworkers to investigate the mechanism of rupture is an example of these elaborate studies. Work by Duckett (2) on studying the contributions of interfiber friction to break energy is another example. Also, a statistical approach was applied by Phoenix (3) in which he adopted the Weibull model to explain the mechanism of breakage of yarns. In this paper a simplified attempt is given to theorize on the strength of blended yarn. The effect of the fiber migration as well as the yarn geometry will be taken into account. The difference in the stress-strain relationship of the fibers in the blend will also be considered.

* Professor of Textile Science, Clemson University,
Clemson, S. C., 29631, U.S.A.

** Reitor of the Instituto Universitario da Beira Interior,
Covilha, Portugal, 6200

RESULTS OF BLENDED YARN STRENGTH

The literature, either in fiber producers' bulletins or scientific journals and periodicals, has shown the relationship of the strength-blend ratio, as given in Figure 1, for cotton-polyester blends. The introduction of the high tenacity polyester has altered the shape of the curve to the one shown in Figure 2. With this development and introduction of high tenacity polyester, yarn designers are more at liberty to use the blend ratio he pleases without restrictions. From the shape of the curve in Figure 1, one can easily realize the fact that cotton/regular polyester blends below 35/65 may cause a reduction in the blended yarn strength below that of 100% cotton. This situation may find a great deal of opposition by the yarn spinners. Accordingly, fiber producers are insisting that the regular polyester blends with cottons should be at a minimum of 65/35 (polyester/cotton). The consumer has been brainwashed over that blend. Comparing the stress-strain curves of the three types of fibers, Figure 3 illustrates the difference.

The question we are addressing in this paper is why the strength-blend curves appear as they do in Figure 1 when blending with regular polyester, whereas it takes the shape in Figure 2 when the polyester used is of the high-tenacity type.

THEORY ON THE STRENGTH OF BLENDED YARN

Referring to Figure 3, assuming that the yarn has one hundred fibers at all blend levels, and assuming an average strength of \bar{S}_A for cotton fiber, an estimate of the 100% cotton

SHAPE OF STRENGTH-BLEND CURVE
FOR COTTON/POLYESTER (REGULAR)

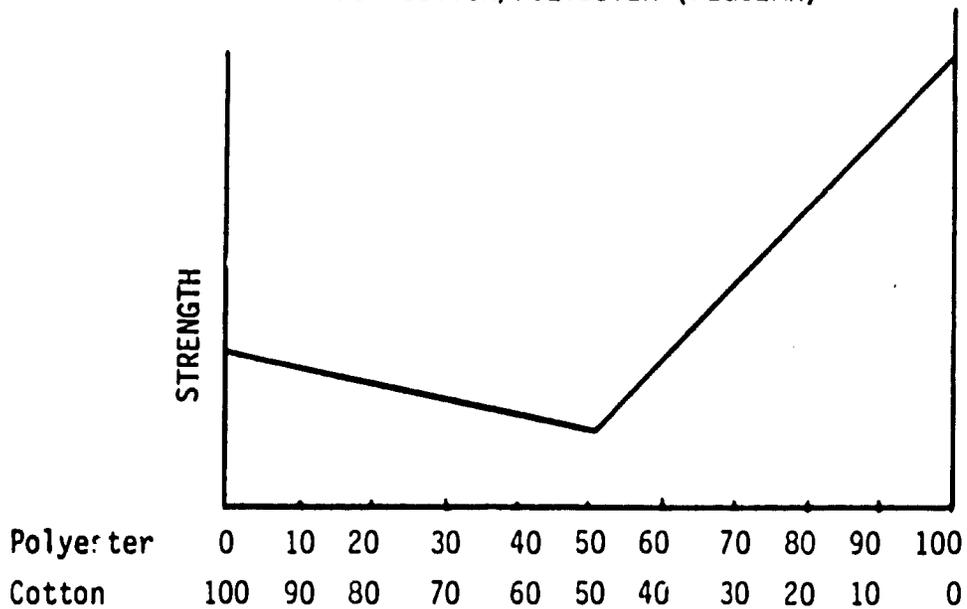


Figure 1. Strength-Blend Relationship for Cotton/Polyester (Regular) Blends.

SHAPE OF STRENGTH-BLEND CURVE
FOR COTTON/POLYESTER (HIGH-TENACITY)

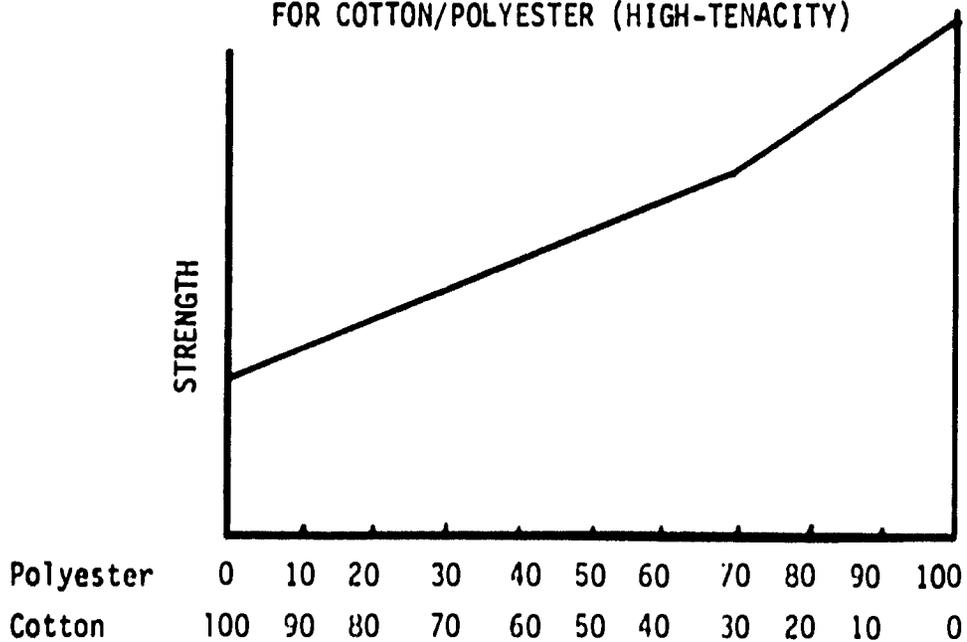


Figure 2. Shape of Strength-Blend Curve for Cotton/Polyester (High-Tenacity) Blends.

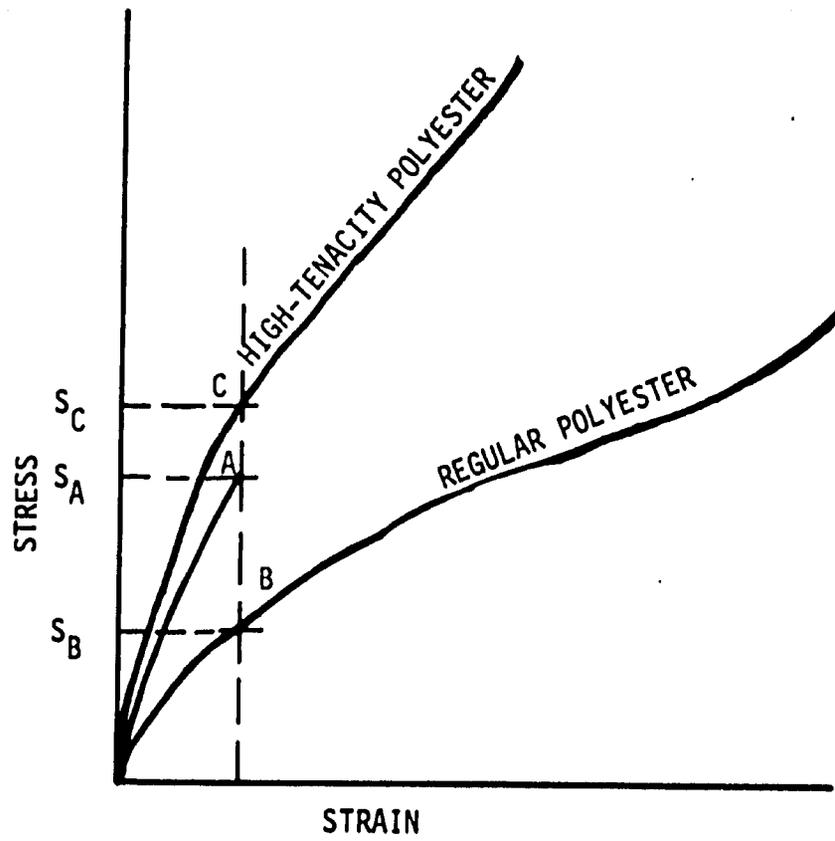


Figure 3. Stress-Strain Relationship of Cotton and Both Regular and High-Tenacity Polyester.

yarn strength will be $100 \bar{S}_A$. By using blends of 5%, 10%, and up to 40% regular polyester, one can see that 5, 10, and up to 40 polyester fibers can only contribute an amount of stress of the average value \bar{S}_B , which is less than what this number of fibers could have contributed if they were cotton fibers. This case will result with a drop in the blended yarn strength up to about 40 to 45% blends. With blends over 50% polyester, the polyester fibers start to provide more mutual support to the cotton fibers and an increase in strength results. But, this strength will only reach the highest value when the yarn is 100% polyester. At this point, one should also note the effect of the fiber migration. Due to the difference in the initial modulus of cotton and regular polyester, the cotton fibers will be migrating to the center of the yarn according to Batavia (4). This zone represents the highly stressed area as is shown by Hearle et al (5) applying the simplified equation:

$$\epsilon_f = \epsilon_y \cos^2 \theta$$

$$\epsilon_f = \text{fiber strain}$$

$$\epsilon_y = \text{yarn strain}$$

$$\theta = \text{twist angle}$$

In this zone, the twist angle θ , is equal to or near the value of zero. This makes the fibers in or near the yarn center under the same strain as the yarn. Whereas the fibers on the yarn surface or in the outer and middle zone will have strain less than that on the yarn. When the cotton fibers are blended with regular polyester, they will be more effective in the stress bearing.

On the other hand, when the high tenacity polyester is used in the blend, the yarn strength increases with any percentage of polyester as shown in Figure 2. Applying this simplified explanation, one can see by referring to Figure 3 that with 5, 10, and up to 100% polyester, the blended yarn strength increases. The contribution of the polyester fibers will be always higher than the corresponding cotton fibers they replaced in the blend. This is readily seen as S_C is larger than S_A . Also, if the phenomenon of migration is taken into account, the blended yarn with the high modulus polyester will have the majority of the polyester fibers in the center. This will result in more contribution by the polyester components of the blend, which are of higher tenacities than cotton at all levels of strain.

It is also worth mentioning that up to the conventional blend ratio of 65/35 polyester/cotton, the fabrics made with blended yarn of regular polyester will have the polyester feel and hand. But, the fabrics woven from blended yarn of high tenacity polyester will have a more cotton feel and handle.

As far as the industry is concerned, they have welcomed this development as they are at liberty to choose the percentage of high-tenacity polyester according to the particular end uses. We are seeing now shirt fabrics with 80/20 cotton/polyester and also bed sheets which will provide the cotton feel and the polyester easy care property.

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ATTACHMENT 14

REFERENCES REQUESTED BY
AVELINO MORGADO
INSTITUTO UNIVERSITARIO DA BEIRA INTERIOR
6200 COVILHÃ
PORTUGAL

1. Carey Arthur Mann, Jr., Twenty-four Dimensional Spin Manifold, (Ph.D. Thesis), Mathematics, M.I.T., 1969.
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ATTACHMENT 15

Exmos. Senhores

Si referencia

Si comunicação

Ni referencia

COVILHA

ASSUNTO: *Convite.*

9 / 3

O INSTITUTO UNIVERSITÁRIO DA BEIRA INTERIOR

Tem o prazer de anunciar que vai realizar duas conferências com os seguintes temas:

- 1 - "QUALIDADE E PRODUTIVIDADE NA PREPARAÇÃO E FIAÇÃO DA LÃ E FIBRAS LONGAS" - 29 de MAIO às 21 H
- 2 - "TENDÊNCIAS E EVOLUÇÃO DAS MÁQUINAS DE FIAÇÃO DE LÃ E FIBRAS LONGAS" - 30 de MAIO às 9 H 30 M

O conferencista será o Prof. M. AVEROUS, Director do CERMAT (Centre de Recherche Mecanique Appliquée au Textile) e Professor de fiação (fibras longas) da Escola Nacional de Industrias Têxteis de Mulhouse.

Dado o interesse que julgamos ter os temas para a indústria, desde já gratos pela vossa colaboração, subscrevemo-nos com os nossos melhores cumprimentos,

O Reitor,



Prof. Doutor C.M. Passos Morgado.

ACCOMPLISHMENTS DURING THE ADVISORY PERIOD



CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

From this report, it can be concluded that the objectives of this consultancy visit were fulfilled. In fact, several more activities were performed upon request to make this visit more successful. This is particularly obvious from the section on other activities.

Reitor Morgado expressed on several occasions his satisfaction with the achievements, especially the development of two local faculty, namely: Maria José Geraldés and José M. Lucas as prospective faculty. The strong relationship with the industry, which came as the result of the three nonwoven seminars, was highly appreciated by Reitor Morgado.

RECOMMENDATIONS

Apart from the above satisfaction with the completion of the mission, a few little incidences occurred upon which the following recommendations are presented. It is our strong belief that these recommendations will be of great assistance in improving the performance of the short-term advisor.

1. A car should be provided for the project to facilitate the transportation problem.
2. A furnished apartment should be provided with cooking facilities and telephone, if possible.
3. The representative at Covilha should be experienced in the textile area, as most of the activities at Covilha are in the textile

field. Clemson might be able to provide such a representative. In such a case, we would request a minimum of one man year. This could be performed in either one whole-year period, two periods of six months each, or three periods of four months each.

4. The representative from Purdue in charge of all the activities in the three Institutes would be in a more favorable position if he was stationed in Lisbon. This would enable him to establish the proper contact needed with the personnel in the Ministry of Education who are in charge of the AID project. Also, he would be close to where the decision-making operation takes place.

PART II*

PAPERS AND SUMMARY OF PRESENTATIONS

By

IUBI FACULTY

IN NONWOVEN SEMINARS

(IN PORTUGUESE)

* Please see this part in separate volume.