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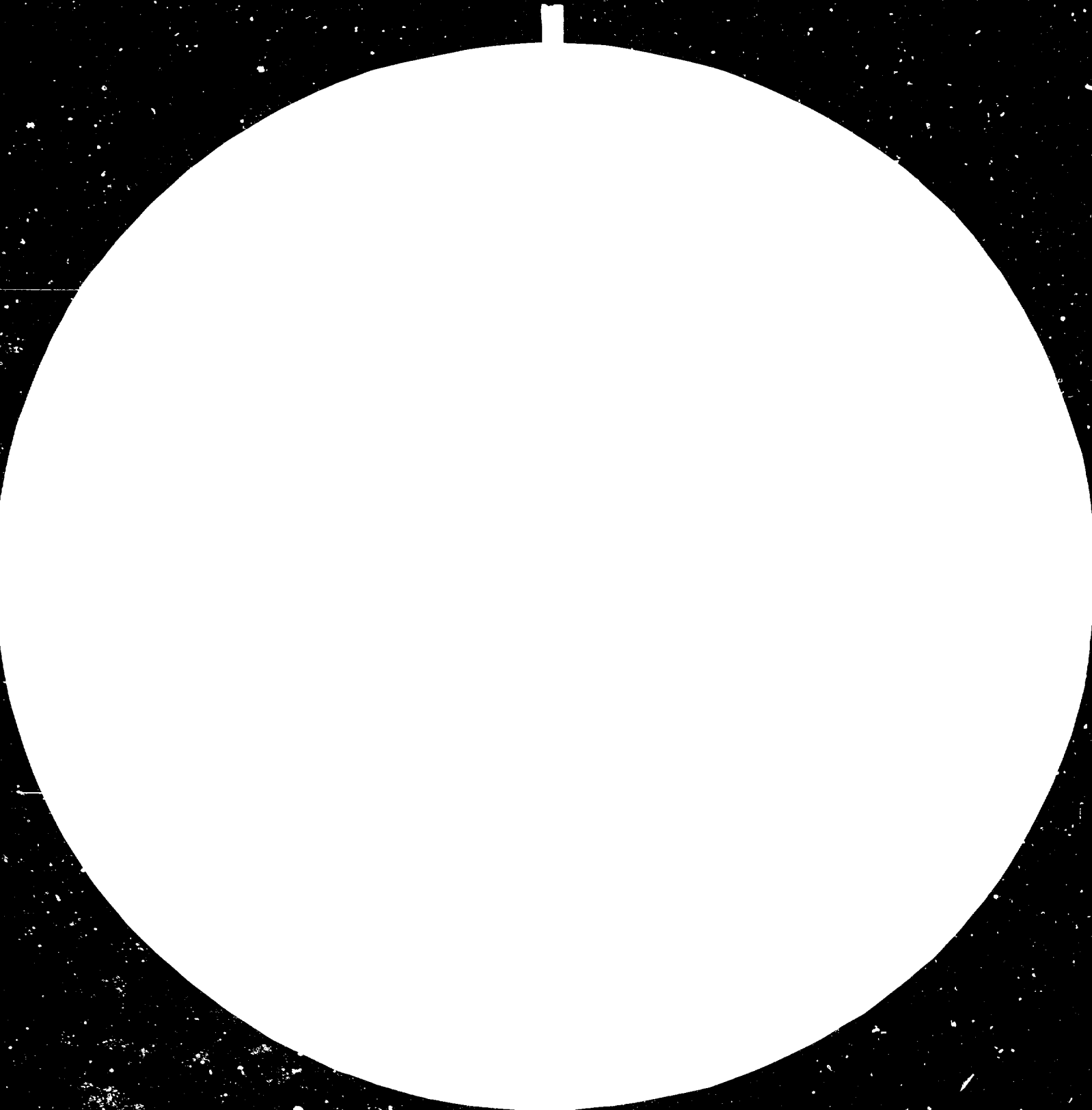
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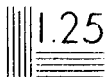
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DP/ID/SER.B/303

4 May 1981

English

DIVERSIFICATION AND DEVELOPMENT OF NEW FABRICS

SITRA - PHASE II

DP/IND/76/023

INDIA

Terminal report*

Developing Training Programmes for the
Knitting Industries of India

Prepared for the Government of India
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of H.L. Sterenberg
Training Adviser

United Nations Industrial Development Organization
Vienna

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DEVELOPING TRAINING PROGRAMMES FOR
THE KNITTING INDUSTRIES OF INDIA

I. SUMMARY

The project aims to strengthen and develop the capacity of the South India Textile Research Association (SITRA) to undertake research, provide specialist advisory services and to conduct industrial training courses for the benefit of the spinning, knitting, dyeing, finishing and making-up mills and factories of South India.

The Training Expert in particular was concerned with the setting-up of training programmes for the existing Knitting Industries in South India.

After familiarizing himself during the first weeks with the state of organization and development of the knitting, bleaching, dyeing, printing, finishing, making-up and related industries of South India, the Training Expert developed a programme for two training courses in Knitting.

After consultation with the Director and Project Leader at SITRA, a tight schedule for evaluating the first training course in circular knitting was fixed for 8 days from 9th to 20th March 1981. Introduction letter and nomination form (See Appendix I) were sent out to the concerned knitting industries.

II. ACKNOWLEDGEMENTS

The work of the UNIDO Training Expert was greatly assisted by the co-operation of the following organizations:

- United Nations Industrial Development Organization, Vienna,
- United Nations Development Programme, Office of the Resident Representative, New Delhi, India,
- The South India Textile Research Association (SITRA), Coimbatore, India,
- Offices of UNDP/UNIDO/SITRA
Diversification and Development of New Fabrics - Phase II Project at New Delhi and Coimbatore.

The Expert would also like to express his great thanks to the Director of SITRA and his Staff for their guidance and good co-operation as well as all those who were of great help for enlightening the expert's task.

Acknowledgement must also be made for the kind hospitality and facilities made available to the Expert by the management, staff and workers of all the factories and institutes visited.

III. INTRODUCTION

The duties proposed for the Training Expert were outlined in Job Description DP/IND/76/023/11-01/31.7.B (See Appendix II)

This UNDP/UNIDO Diversification and Development of New Fabrics, Phase II Project was set-up for assisting the Government of India through the South India Textile Research Association (SITRA) for a duration of two years to contribute to increased employment opportunities in the Knitting Industry in South India, to greater manufacturing stability and to the development of a strong and viable Knitting Sector capable eventually of developing larger export markets.

As an UNIDO Expert, attached to the South India Textile Research Association (SITRA), the related immediate objective of the Training Expert was to develop a training programme suitable for the knitting industries in India and with particular reference to the needs of small scale organizations. Besides that, detailed syllabuses for the training programmes should be provided and the first course evaluated, while on the other hand advice on the schedule for the implementation of other internal and external training programmes for dyeing and making-up should be given.

A schedule for implementation of the first knitting course was made (see Appendix III).

The assignment covered the period from 20th January 1981 to 21st April 1981.

IV. FINDINGS

A. Factory Visits

<u>Factory</u>	<u>Date of visit</u>	<u>Machines</u>	<u>Products</u>
1. Selvaraja Mills Pvt. Ltd., Post Box No.3501, Coimbatore-641 016.	30-1-81	Spinning	Cotton hosiery yarn
<u>Remarks:</u> Only mechanical yarn clearance			
2. The Lakshmi Mills Co. Ltd., 348 Avanashi Road, Coimbatore-641 037.	31-1-81	Spinning Weaving	Yarns, sarees, Shirtings.
<u>Remarks:</u> Only mechanical yarn clearance			
3. Tirupur Textiles Pvt. Ltd., Post Box 153, Tirupur 638603	2-2-81	+160 circular knitting, spinning	1 x 1 rib Interlock Plain fabrics cotton yarns
<u>Remarks:</u> Only mechanical yarn clearance. Mainly producing 1x1 rib fabrics, interested in achieving improved quality.			
4. Crystal Garments, 2/7 Kongunagar Main Road, Tirupur-2.	2-2-81	Spinning Making-up	Under wear Outer wear
<u>Remarks:</u> Manufacturers of coloured & white rib quality under wear and shirtings			

5. Mohan Knitting Co., 2-2-81 +20 Circular Banians,
Kamaraj Road, Knitting, T-Shirts
Tirupur-4. Making-up

Remarks: Cheap mass production

6. The South India 2-2-81
Hosiery Manufacturers' 25-2-81
Association,
78/12, Kumaran Road,
Tirupur-638601

Remarks: One of the 3 Knitting Manufacturers'
Association in South India.

7. Katav Knitting Mills, 2-2-81 +20 Circular Banians,
Dharapuram Road, Knitting Briefs.
Tirupur-4. Making-up

Remarks: Cheap quality

8. Balaji Hosieries, 2-2-81 +20 Circular Jobber
Devangapuram, Knitting
Tirupur-2.

Remarks: Finishing shirts with button-hole
and button sewing.

9. Jay Jay Mills, 2-2-81 +100 circular Banians &
Kongunagar Main Road, Knitting Briefs
Tirupur 538 602 Making-up

Remarks: Machines too close to each other, less
work space.

10. Knitmac 3-2-81 Builder of knitting
Knitting and Textile machinery including
Machinery Works, teaching machines.
Coimbatore 641005

11. Ramani Textiles 4-2-81 Batik printer Batiks
Printers,
1-C, Ahilmedu St.,
Erode 638001

Remarks: Simple set-up

12. S.S.M.Processing Mills
Komarapalayam-638181 4-2-81 Dyeing/
Finishing of
woven cloth
& embroidery Sarees
- Remarks: Modern set-up with sophisticated equipment
13. S.S.Marichettiar,
Salem Main Road,
Komarapalayam-638183 4-2-81 Institute of
Textile
Technology Certificate
Courses in
Knitting.
- Remarks: Starting Textile Educational Institute for weaving, dyeing/finishing and knitting
14. Tirupur Textiles
Private Ltd.,
Processing Division,
Mettur Road,
Bhavani-638 302 4-2-81 Dyeing/finish
Knit wear Flated
tube knits
- Remarks: Specialized on tubular knitwear, needs guidance on selection of right equipment.
15. Commercial Trading Co. 5-2-81 +10 circular
18-B, Avanashi Road,
Tirupur-3 machines
Bleaching
Making-up Banians
Shirts
- Remarks: Trade name "Binny"
16. Leela Hosiery Mills, 5-2-81 Circular &
Rayappapuram Extn.,
Tirupur-638601 Hand flat
Machines,
Making-up Banians,
Shirtings,
T-shirts
- Remarks: Very interested in export quality
17. Ashoka International, 5-2-81 Sewing
10/10 Kongunagar Extn.,
IInd Street,
Tirupur-638 502 Making-up T-shirts
Sweaters
Shirts
- Remarks: Mainly fashion export goods for over US\$ 8 million yearly to Europe, USA, Canada.

- | | | | |
|---|--------|---|---------------------|
| 18. Indira Steam
Calendering,
Tirupur. | 5-2-81 | Calendering | Tubular
Knitwear |
| 19. Sonar Dyeing & Screen
Printing Works,
Alankadu,
Karuvampalayam,
Tirupur-638 604 | 5-2-81 | Dyeing/
Finishing,
Raising | Knitwear |
| 20. T.M. Knittings,
Kongu Main Road,
Tirupur-638602. | 5-2-81 | +20 Circular
knitting,
making-up. | Banians,
Briefs. |

Remarks: Cheap quality, traditional articles.

- | | | | |
|---|--------|-----------|---------------------|
| 21. Jeeva Tailoring
Factory,
8-H(4-C) Kuppanna
Chettiar St.
Tirupur-638604. | 5-2-81 | Making-up | Banians,
Shirts. |
|---|--------|-----------|---------------------|

Remarks: Jobber on garments

- | | | | |
|---|--------|--|----------------------|
| 22. Khadar Knitting Co.,
Kamaraj Road,
Tirupur-638604 | 5-2-81 | +80 Circular
knitting,
bleaching,
dyeing/finish | Banians,
T-Shirts |
|---|--------|--|----------------------|

Remarks: One of the older established knitters,
conservative lay-outs traditional articles

- | | | | |
|--|--------|-----------|---------------------|
| 23. Talash Steam Calendering
Tirupur. | 5-2-81 | Calenders | Tubular
knitwear |
|--|--------|-----------|---------------------|

Remarks: Commission finisher with new local made
steam calender with over-feeding.

- | | | | |
|--|--------|-------------------------|--|
| 24. ISI Standards
Laboratory,
Tirupur. | 5-2-81 | Laboratory
equipment | Spot-checking
Standards
Banians. |
|--|--------|-------------------------|--|

25. Bharathi Knitting Company,
Valipalayam,
Tirupur-638 601. 6-2-81 +60 circular machines,
Making-up Shirts, T-shirts, Sweaters.

Remarks: Fashion line in exports

26. India Dyeing, Karuvampalayam,
Tirupur. 6-2-81 Bleaching, Dyeing, Finishing Tubular knitwear

Remarks: Oil burner for steam production

27. Exotic, Tirupur. 6-2-81 Making-up Shirts

Remarks: Developed a fashion line in knitted shirts for the export trade.

28. Miller Hosieries, P.N.Road,
Tirupur-638 602 6-2-81 +70 circular machine, Making-up Banians Shirts

Remarks: Improving sewing department set-up.

29. Ramkumar Knitting Mills,
College Road,
Tirupur-638 602 6-2-81 +20 circular machine, making-up Banians

Remarks: Traditional articles

30. Tantex Ltd., Vallam 1 Road,
Thanjavur-613 005 7-2-81 +80 circular knitting M/c. bleaching, finishing, making-up Banians, Briefs

Remarks: Production + 850 dozen traditional banians/briefs daily. Sales market only Southern part of India.

31. The Palani Andavar Mills Ltd., 136/1 Dhally Road, Udamalpet-642125.	11-3-81	Spinning +60 circular Machines	Cotton yarns Knitwear Jobbers
---	---------	--------------------------------------	-------------------------------------

Remarks: Uneven knitwear due to uneven spun yarn.
Only mechanical yarn clearance.

B. Training Courses

After the factory visits and familiarizing himself with the state of affairs of organization and development of the knitting, bleaching, dyeing, printing, finishing and garment making-up factories in the South of India and mainly the district of Tirupur, the expert found that mainly a traditional kind of knit-wear was produced on similar machines with less diversifications due to lack of basic knitting technologies. Non of the visited manufacturers had a qualified educational and theoretical background in knitting, while on the other hand, with extending of production in the traditional manufacturing field of banians, over-production in the near future might arise, with all the economical disadvantages of this. So, for avoiding this before-hand and to train the managers in diversifications on the commonly used machinery, it was decided to develop first a supervisory level management course in circular knitting and after that a training course for operatives in hand flat knitting. The first course would be evaluated during the time the expert was on duty at Coimbatore. Syllabuses (Appendix IV & V) were written and course material collected, rewritten and bundled according to these.

40 nominations were received for the circular knitting course scheduled from 9th to 20th March 1981, of which a selection list for 25 participants was made (Appendix VI). A profile of the participants and their companies was evaluated (Appendix VII).

During the two weeks of the course lectures were attended by an average of 23 participants, who all showed up within an hour after starting time with at least 17 participants in the morning every day.

In the following days of the course it was found that the most elementary basics in knitting technology were lacking and a lot of time was consumed to make understandable the loop/stitch structure, courses/wales, tuck/miss and plain, 1x1 rib and interlock fabrics.

To avoid this in future the programme should be modified and started with one week training on the Hand Flat Knitting machines, of which at least 3 days practical operation will be taught in basic knitting constructions and fabric analysing.

Findings about the Course By Participants in %

	Very good	Good	Satisfactory	Unsatisfactory	No answer
General Impression	20	70	10	-	-
Coverage of subjects	-	45	30	20	5
Arrangements for course	20	30	45	5	-
Lectures	-	60	35	5	-
Audio visual aids	15	60	20	-	5
Practicals	40	45	15	-	-
Discussion sessions	5	35	5	10	45
	Too long	Slightly longer	About right	Too short	-
Duration of course	-	15	40	45	-

The most comprehensive topic was the subject QUALITY CONTROL, which scored 80% by all the participants, while ideas from the course that could be implemented by participants were the introduction or improving of Quality Control and Diversification in Existing Machines both with 45% of the participants.

During the Quality Control lecture on standards for a good knitting yarn, laboratory tests were made at SITRA upto the demand of the Expert with aid of the dynamometer and Classimat equipment. Besides that the count was measured on short distances of 30 yards, which showed a variation from 28.8 for the lowest to 42.5 for the highest deviations in the tested count of Ne, 1/40 cotton. C.V. of count was 7.1% (Standard 3%). Slubs, thicker than a knot according to Classimat chart A4, B4, C3, C4, D3 and D4 were 18 per kg. (Standard 5 per kg.)

In knitting, evenness of the yarn on short distance is very important, because of running one course of single yarn after each other. The ball chart of the Dynamometer showed a wide diagram (spreading instead of a small pyramid), which indicates already the unevenness in the spun yarn. The twist was rather high upto 23.8 turns/inch (Standard 19.5 t/inch).

V. ACHIEVEMENTS

As already mentioned in the Summary, the main purpose of the training expert was the setting-up of training programmes for the existing knitting industries in South India.

The following programmes have been realised during the expert's short assignment's period:

1. Circular Knitting Training Course
2. Hand Flat Knitting Training Course.

Ad.1: The Circular Knitting Training Course has been organized, implemented and evaluated from 9th to 20th March 1981 and the results can be concluded from the statistical survey made out of the questionnaire filled in by the participants on the last day of the course (Appendix VIII).

Ad.2: The Hand Flat Knitting Training Course, written for operatives can be implemented only then, when there are at least 10 hand flat knitting machines available at SITRA, which might become realised during the latter half of this year.

VI. RECOMMENDATIONS

1. Develop a full fledged KNITTING CENTRE at SITRA, Coimbatore, to provide training and specialised technical, product-development and managerial services to the all over Knitting-annex specialized dyeing/finishing and garment-making industry, advising potential entrepreneurs on the selection of equipment and processes.

This Knitting Centre should contribute to increased employment opportunities in the Knitting Industry in South India, to greater manufacturing stability and to the development of a strong and viable Knitting Sector capable eventually of developing larger export markets.

The set-up of the Knitting Centre should as follows:

a) Production Demonstration Department
with machines for:

- i. Circular knitting
- ii. Flat knitting
- iii. Hosiery knitting
- iv. Warp knitting
- v. Raschel knitting
- vi. Dyeing and Finishing
- vii. Winding
- viii. Garment making
- ix. Controlling

b) Sample Library with Samples Knitted in:

- i. Single and double jersey
- ii. Rib and Interlock
- iii. Purl stitch and fully fashioned
- iv. Flat and Circular Outerwear

- v. Socks and Stockings
- vi. Gloves and ribbons
- vii. Jacquards
- viii. Warp and raschel knitting
- ix. Weft insertion
- x. Embroidery
- xi. Crochetta

c) Design and Fashion Library with Documentation on:

- i. Fashion trends
- ii. Colour forecasting
- iii. Prints/designs
- iv. Fashion magazines
- v. Modelling/styling
- vi. Fancy and plain yarns

d) Documentation Library with:

Leaflets and documentation from machinery manufacturers on knitting, dyeing, finishing, printing, garment making and auxiliary machinery.

e) Quality Control, Setting-up of Standards for:

- i. Knitting yarns
- ii. End products
- iii. Size charts for garments
- iv. Export manuals
- v. Dimensional stability of knitwear

f) Training Courses, setting-up of these for:

- i. Operatives
- ii. Fixers/mechanics
- iii. Supervisors
- iv. Managers
 - in the field of:
 - flat, circular, warp and raschel knitting
 - bleaching/dyeing, printing and finishing
 - garment making-up

g) Service Centres

Setting-up of these as branches in the knitting districts of the South of India and providing technical and managerial assistance to the mainly small scale industry. Besides that these service centres could serve as a co-operative random sampling testing unit for the purchased knitting yarns with a small laboratory set-up.

h) Product Development Department

On a co-operative base for providing information regarding new products, new developments in raw materials and equipment, colour forecasting, fashion, styling, garment-making, new markets, etc. to be sent periodical to all the members.

2. Training programmes for dyeing/finishing and garment making-up can be developed as soon as the concerned experts arrive in their duty station.
3. Purchase the planned dyeing/finishing and garment making-up equipment mentioned in Annexe V and VI of Technical Report of Dr.M.S.Burnip. dated 23 September 1980 as soon as possible.
4. After installing and approving of this equipment, training courses including the practicals can be given straight away.

APPENDIX I

THE SOUTH INDIA TEXTILE RESEARCH ASSOCIATION, COIMBATORE-641 014.
INDIA

VII/2/ /81

27.2.1981

Dear Sir:

TRAINING PROGRAMME FOR KNITTING TECHNOLOGISTS

South India Textile Research Association (SITRA), Coimbatore announces a training programme in Knitting Technology specially designed for Managers/Supervisors of Knitting Factories.

Mr.Hans Leo Sterenberg, Training Expert in Knitting from the United Nations Industrial Development Organisation (UNIDO) will personally supervise and conduct the training programme. Apart from Mr.Hans Sterenberg, the Course will be addressed by the Inter Disciplinary Specialist Faculty of SITRA. The programme will comprise of theory and practical sessions.

A full time programme of eight days duration commencing on Monday, March 9, 1981 and concluding on Friday, March 20, 1981 has been scheduled at the Seminar Hall, SITRA, Coimbatore. To ensure effective participation by Managers of Knitting Factories at Tirupur, the programme will be conducted from 10.00 a.m. to 5.00 p.m. on the following dates:

March 9 & 10, 12 & 13, 1981

March 16 & 17, 19 & 20, 1981

A subsidised fee of Rs.150/- per candidate will be levied for participation in the programme to cover cost of Course materials and lunch. Certificates will be distributed to those who ensure a minimum of 90% attendance.

Nominees for the programme should have had practical managerial or supervisory experience in the knitting industry and should be able to follow lectures in English.

The programme will cover the following topics:

Textile Fibres and Yarn
Knitting Machinery
Knitted Fabric Structure
Maintenance of Knitting Machine
Quality Control
Diversification & Development of New Products

Candidates will be admitted to the programme on a "first come first served basis", subject to fulfilment of minimum requirements relating to practical knowledge and experience of the knitting industry and ability to understand and speak English.

Enclosed is a Nomination Form for sponsoring candidates for the programme. Kindly have the form duly completed and mailed to SITRA, Coimbatore-641014 on or before March 5, 1981.

With kind regards,

Yours sincerely,

Sd/- K.Sreenivasan,
Director.

NOMINATION FORM*

PROGRAMME FOR KNITTING TECHNOLOGISTS

(SITRA, Coimbatore, March 9 - 20, 1981)

Name of Factory :

Name of Participant :

Designation :

Educational Qualifications :

Experience in Knitting Industry :

Cheque for Rs.150/- payable to
South India Textile Research
Association, Coimbatore enclosed :

Cheque No. Date :

Bank :

Place:

Date:

SIGNATURE

* If more than one candidate is deputed
particulars may be given in separate
typed sheets.

(Kindly return this Form duly completed on or before 5.3.1981
to THE DIRECTOR, SITRA, COIMBATORE-641014)

Appendix II

UNITED NATIONS

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNIDO

11th September 1980

PROJECT IN THE REPUBLIC OF INDIA

JOB DESCRIPTION
DP/IND/76/023/11-01/31.7.B

Post title Training Adviser

Duration Three months

Date required January 1981

Duty Station Coimbatore

Purpose of Project To strengthen and develop the capacity of the South India Textile Research Association (SITRA) to undertake research, provide specialist advisory services and to conduct industrial training courses for the benefit of the spinning, knitting, dyeing and finishing and making up mills and factories in the Southern region of the country.

DUTIES In co-operation with the Director and Project Leader at SITRA, the expert is specifically expected to:

1. Become familiar with the state of organisation and development of the knitting, bleaching, dyeing, printing and finishing, making-up and related textile industries in the Southern regions of country;
2. Identify those areas and job function both within SITRA and in the above industries which require training programmes;
3. Develop a training programme suitable for the knitting industries in the country, with particular reference to the needs of small-scale organisations; this programme will be worked out in co-operation with the local counterpart responsible for training;

4. Prepare a detailed syllabus for the training programme, with the assistance of the local counterpart and technical staff of SITRA;
5. Organise, implement and evaluate the first course as a demonstration of training activities and give advice, if necessary, on the modification of the programme for optimum results;
6. Give advice on the schedule for the implementation of other internal and external training programmes for dyeing and making-up.

The expert will also be expected to prepare a final report, setting out the findings of the mission and recommendations to the Government on further action which might be taken

QUALIFICATIONS

University degree in Technology/Mechanical Engineering/Chemical Technology with relevant studies in textiles; formal qualification in training an asset; experience in the textile industry, especially the knitting or making-up sectors and extensive experience in the preparation and evaluation of curriculum for training courses in knitting and preferably making-up or dyeing and finishing

LANGUAGE

English

BACKGROUND INFORMATION

During the first phase of this project, UNDP/UNIDO assistance concentrated upon the improvement of the quality of the yarn, training in knitting technology and the provision of technical services to the knitting industry. The present phase aims to build upon the achievements of the first phase and to further develop the expertise of SITRA staff in relation to the needs of the knitting, dyeing and finishing and making-up industries. It will also extend appropriate research and development activities in these areas related to the needs of the hosiery and associated industries on both the short and long term. It will also institute technical liaison and training courses in these three areas of industrial activities.

In addition to the duties performed by the expert in training, other UNIDO experts in knitting, dyeing and finishing and making-up as well as the services of an overall project consultant have been, or will be, made available to the project.

APPENDIX III

TRAINING COURSE FOR SUPERVISORY LEVEL MANAGEMENT ON CIRCULAR KNITTING
SITRA, Coimbatore : March 9 - 20 1981

Day	10.00-10.40	10.40-11.20	11.20-11.40	11.40-12.20	12.20-1.00	1.00-2.00	2.00-5.00
Monday March 9	Inaugural	Knitting Machinery & Diversification 8,9 HLS	COFFEE BREAK	Knitting Machinery & Diversification 8,9 HLS		LUNCH	Practicals
Tuesday March 10	Textiles Fibres & Yarns 1,4 VRS	Knitting Machinery & Diversification 1,2 TMKV		Basic Construction in Weft Knitting 1,2,3 RR	Knitting Machinery & Diversification 1,2 TMKV		Practicals
Wednesday March 11	-	-		-	-		-
Thursday March 12	Basic Construction in Weft Knitting 2 RR	Knitting Machinery & Diversification 3,4 TMKV		Knitting Machinery & Diversification 6,7,10 RR	Basic Construction in Weft Knitting 4,5,6 HLS		Practicals
Friday March 13	Basic Construction in Weft Knitting 2 RR	Basic Training on Circular Knitting Machinery 1,2,3,4 TMKV		Basic Training on Circular Knitting Machinery 8,9,10 RR	Knitting Machinery & Diversification 5 TMKV		Practicals
Monday March 16	Basic Training on Circular Knitting Machinery 5,6,7 TMKV	Basic Construction in Weft Knitting 2 RR		Quality Control 1,2,3,4 HLS	Basic Training on Circular Knitting Machinery 11,12,13 RR		Practicals
Tuesday March 17	Maintenance of Knitting Machinery 1,2 TMKV	Quality Control 5,6,7 HLS		Practical Quality Control 1,2,3 TMKV			Practicals
Wednesday March 18	-	-		-	-		-
Thursday March 19	Maintenance of Knitting Machinery 3 TMKV	Basic Calculations Set up 1,2 HLS		Practical-Quality Control 6,7 RR	Fault Analysis 4 TMKV		Practicals
Friday March 20	Product Development 1-7 HLS			Discussions			Practicals/ Valedictory and Distribution of Certificates

HLS: HANS L.STERENBERG; VRS: V.R.SIVAKUMAR; TMKV: T.M.K.VARMA; RR: R.RAMAMURTHY

APPENDIX IV

SYLLABUS - CIRCULAR KNITTING TRAINING COURSE

I. TEXTILE FIBRES AND YARNS

- 1 - General textile fibres, vegetable, animal, man-made
- 2 - Fineness of yarns, count and conversion table
- 3 - Hosiery yarns, evenness, twist, imperfections
- 4 - Textured yarns

II. KNITTING MACHINERY AND DIVERSIFICATIONS

- 1 - Looping elements
- 2 - Knitting machine mechanisms
- 3 - Machine drive mechanisms
- 4 - Fabric drawing-off mechanisms
- 5 - Jacquard for weft knitting
- 6 - Warp knitting
- 7 - Stitch variations
- 8 - Variety of knitting machines
- 9 - Diversifications/end-uses
- 10 - Recommended yarn count in relating to machine gauge tables

III. BASIC CONSTRUCTIONS IN WEFT KNITTING

- 1 - Terminology in weft knitting
- 2 - Various knitting constructions with their drawings
- 3 - Decomposing knitwear
- 4 - Feeders mixing with different yarns
- 5 - Knitting constructions with feeders mixing and sampling
- 6 - Fabrics and stitches

IV. BASIC TRAINING ON A CIRCULAR KNITTING MACHINE

- 1 - Machine mechanism
- 2 - Threading-up
- 3 - Yarn feeding
- 4 - Timing
- 5 - Cam plates & setting
- 6 - Patterning and sampling
- 7 - Running-on
- 8 - Needle arrangements
- 9 - Course spirality
- 10 - Stitch lengths
- 11 - Quality control
- 12 - Instrumentation and gauges
- 13 - Alternative stitch forms

V. MAINTENANCE OF KNITTING MACHINES

- 1 - Concepts maintenance
- 2 - Threading of the machine
- 3 - Gating and timing
- 4 - Faults analysis

VI. QUALITY CONTROL

- 1 - Textile testing
- 2 - Quality and process control
- 3 - Standards set-up
- 4 - Equipment for quality control laboratory
- 5 - Recommendations for quality control programmes
- 6 - Export manual
- 7 - Random sampling test method

VII. PRACTICAL QUALITY CONTROL IN KNITTING

- 1 - Yarn, knitting, finishing, making-up control
- 2 - Analysing records
- 3 - Knitting machine adjustment
- 4 - Fabric quality control
- 5 - Table variables affecting knitting performance
- 6 - Optimum relationship between yarn count and yarn
input tension
- 7 - Tightness factor

VIII. BASIC CALCULATION SET-UP

- 1 - Production capacity formula
- 2 - Fabric calculation sheets set-up

IX. PRODUCT-DEVELOPMENT

- 1 - Diversification
- 2 - Market-research
- 3 - Line of products
- 4 - Raw materials
- 5 - Designing
- 6 - Fashion direction
- 7 - Consumers' desires

X. PRACTICAL

- Operating on knitting machines,
Adjustments and settings,
Design possibilities,
Repairing of faults,
Various knitting constructions, etc.

-:o:-

Duration course: approx. 2 weeks

Total participants: maximum 20

Educational background: High School - Knowledge English

Factory level: Supervisory Management.

Coimbatore, 20.2.1981

Hans L. STERENBERG
UNIDO Expert.

APPENDIX V

SYLLABUS - HAND FLAT KNITTING TRAINING COURSE

I. FLAT KNITTING BACKGROUND

- Principle of Knitting
- Type of machines
- Relation gauge - yarn count
- Cams flat knitting

II. DESCRIPTION OF THE PRINCIPAL MECHANISMS

- Principal mechanisms like needles, carriage with cams, needle-bed, yarn carrier, racking, accessories.

III. KNITTING

- Preparation yarn, knotting and threading yarn
- Yarn counts
- Basic knitting structures
- Variations in knitting
- Draw thread
- Press off
- Widenings and narrowings with special handle
- Chain stitch
- Take down

IV. SAMPLING

- Needle selection
- Fancy stitches, cable, jacquard, tweed and knop stitches
- Borders
- Scallop
- Fringes

V. MAKING UP

- Taking measurements
- Calculation pattern
- Sewing together
- Collars
- Pockets
- Button holes
- Steaming/ironing

VI. EXTRAS AND ACCESSORIES

- Power drive
- Auxiliary cams
- 5 colour striper
- Presser
- Widening-appliance
- Laying-in and V-neck carrier
- Flaiting feeder

VII. MAINTENANCE OF THE MACHINE

- Cleaning/oiling
- Daily/weekly maintenance
- Adjustment feeders
- Changing needles
- Setting brushes
- Dismantling/assembling the carriage

VIII. CONDITIONS FOR GOOD WORK

- Faults analysis regarding the needles, yarn, stitches, fabric, carriage, selvages and cleanliness

IX. PRACTICAL KNITTING OF SAMPLES

- Explanation of practical knitting with
- The 4 basic groups in knitting
- A total of 65 samples are selected for knitting

-:0:-

Duration Course: approx. 3 weeks

Total participants: dependable on available hand
knitting machines
(at the moment 3 at SITRA)

Factory level: Operatives

Coimbatore, 20.2.1981

Hans L. STERENBERG
UNIDO Expert.

APPENDIX VI

TRAINING PROGRAMME FOR KNITTING TECHNOLOGISTS

SITRA, Coimbatore - March 1981

LIST OF PARTICIPANTS

Sl.No.	Name	Qualification	Organization
1.	Ahmed	-	Mettur Beardsell Ltd.
2.	Aravindakshan	DTT	Kelknit
3.	Balasubramanian	PUC	Soft Textiles
4.	Balasubramaniyam	M.Com.,DTT	Jay Jay Mills
5.	Dharmendra Kumar J.	-	Dharmendra & Co.
6.	Kandaswamy K.	PTC	Holland Hosiery Mills
7.	Kandaswamy M.	B.Sc.	Okey Textiles
8.	Karthikeyan K.	B.Com.	Mohan Knitting Co.
9.	Mohan	-	TanTex
10.	Muthuswamy N.	B.Com.	Fancy Knitting Works
11.	Natarajan	M.Tech.	Phantom Knitters
12.	Radhakrishnan P.	PUC	Manis Knitting Co.
13.	Rajalingam	PUC	Bharati Knitting Co.
14.	Rajendran R.	-	Balamurali Hosieries
15.	Ramasubramaniam	M.Tech.	-
16.	Rangaswamy M.	-	Chitralaya Banian Co.
17.	Sekaran V.	DTT	Palani Andavar Mills
18.	Selvam M.M.	B.Sc.	Yuvaraj International
19.	Sivashanmugham G.	B.Com.	Ramkumar Knitting Mills
20.	Subash M.G.	-	Karur Knitting Co.
21.	Syed Barkath	B.Com.	Travancore Knitting Co.
22.	Thiagarajan R.	B.A.	Design Knitting
23.	Thirumalai R.	B.A.	Keyam Knitting Co.
24.	Thirumurthy R.	B.Com.,B.L. DBA, DTT	Miller Hosieries
25.	Thyagarajan V.	B.Tech.	Binnys

APPENDIX VII

SITRA Programme for Knitting Technologists

Batch I March 9 - 20, 1981

Profile of Participants

1. Organisation where the participants are employed

Category	Per cent of Participants(N:25)
Hosiery manufacturer	76
Medium/large scale manufacturers*	12
Mills manufacturing Hosiery yarn	12

* BINTEX, TANTEX, KELKNIT

2. Status of participants

Designation	Per cent of Participants(N:25)
Owner/Mg. Partner/Partner	64
Manager/Management staff	12
Supervisor/Assistant	

3. Educational Qualifications of Participants

Education	Per cent of Participants(N:25)
M.Tech.	8
D.T.T.	12
Graduates: B.Com./B.A./B.Sc.	40
Post Graduates	8
PTC/PUC	16
SSLC	16

4. Experience in Knitting Industry

Experience in Years	Per cent of Participants(N:25)
Less than 1 year	16
1 - 5 "	40
6 - 10 "	24
11 - 15 "	8
Not given	12

5. Number employed (staff and workers) in the factories represented by participants

Number Employed	Frequency (N: 20)
1 - 25	5
26 - 50	8
51 - 75	1
76 - 100	1
100 +	3
Data not furnished	2
Total	20

Appendix VIII

TRAINING PROGRAMME FOR KNITTING TECHNOLOGISTS
SITRA, COIMBATORE.

March 9 - 20, 1981

Number of participants : 25

Number submitting : 20
Evaluation Forms

1. Impressions on the Course, Coverage of Subjects and General Arrangements.

Criteria Rated	Per cent of participants mentioning (N:20)				
	Very Good	Good	Satisfactory	Unsatisfactory	No Answer
General impression about the Course	20	70	10	-	-
Coverage of subjects	-	45	30	20	5
Arrangements for Course	20	30	45	5	-
	Too long	Slightly longer	About right	Too Short	
Duration of Course	-	15	40	45	

2. Rating Effectiveness of Techniques Used in Course Presentation

Techniques used	Per cent of participants mentioning (N:20)				
	Very good	Good	Fair	Unsatisfactory	No Answer
Lecture	-	60	35	5	-
Audio Visual Aids	15	60	20	-	5
Practicals	40	45	15	-	-
Discussion Sessions	5	35	5	10	45

3. Per cent of Respondents Mentioning Topics Found Most Useful, to be Allotted More Time and to be Removed from the Course.

Topics	Per cent mentioning (N:20)		
	Found Most Useful	To be Allotted More Time	To be Removed from the Course
Quality Control	80	20	-
Machinery Maintenance	45	20	10
Demonstration-Working of Machines	40	35	-
Basic Calculation Set Up	20	15	5
Fabric Analysis	20	5	5
Fabric Construction	15	-	-
Flat Knitting Machine	-	5	-
Weft Knitting - Basic Construction	15	5	20
Warp Knitting	-	-	5
Circular Knitting - Basic Training in Machines	15	15	5
Diversification - New Product/Pattern Development	15	15	10
Fault Analysis	10	10	-
Textile Fibres & Yarn	5	15	10
Jacquard Knitting Mechanism	-	-	15
Modern Machines not used in India	-	-	10

4. Per cent of Participants Suggesting Additional Topics to be Covered in Future Programmes.

Topic	Per cent Mentioning N:20
Garment Making	25
Sewing Machine Technology/Stitching Machinery	50
Flat Knitting Machines	20
Bleaching	45
Dyeing	40
Calendering	10
Printing	10
Processing of Knitted Cloth	20
Improving Productivity	10
Minimising Shrinkage in Garments	10

5. Ideas from the Course that Could be Implemented by Participants.

Ideas for Implementation	Per cent Mentioning N:20
Introduce/Improve Quality Control	45
Diversify Products in Existing Machines (Bring out new designs*)	45
Improve Machine Maintenance	10
Improve Productivity	15
Introduce Production Records	10
Introduce Scientific Costing	10
Test Yarn for Quality	10
Introduce Positive Feed in Knitting Machines	5

* Produce vertical stripes in interlock; Bring out new products from interlock and rib machines with dyed yarn; make outer-wear with acrylic and cotton on single jersey.

6. Suggestions for Improvement

Suggestions	Per cent Mentioning N:20
Have more practical sessions	10
Get more machines for practicals	5
Teach principles of knitting more elaborately	5
Extend duration of course	5
Distribute notes a day in advance	5
Ensure follow-up with participants	5
Organise seminar on finishing, sewing machines	5

7. Areas for Training as Identified by Participants

A two year diploma in knitting technology	10
Basic course in factory management	20
Marketing management	35
Costing	15
Quality control	10
Training of Foremen/supervisory staff	45
Machine maintenance	30
Product diversification - design & pattern	15
Flat knitting	25
Garment making	30
Sewing Machine technology	30
Knitted cloth processing	30
New fashions in knit wear	10

8. Suggestions on Optimum Duration for Future Programme

	Per cent Mentioning N:20
One week	15
Two weeks	35
One month	30
Two months	5
Three months	15

9. How Frequently should Similar Programmes be Conducted?

Once a year	40
Twice a year	30
Thrice a year	5
Periodically	10
Afternoon only	15

10. Suggestions Regarding Venue for the Course

SITRA	50
Tirupur	30
For Management	at SITRA 5
	at Tirupur 5
For Foremen	at SITRA 5
	at Tirupur 5

11. Should the Course Announcement be sent Directly by SITRA or Through the Association?

Routing	Per cent Mentioning N: 20
Directly by SITRA	90
Sponsored by Association	10

12. What in your Opinion should be the Ideal Fee per Day for Participation in the Course?

Rs. 5	10
Rs. 10	20
Rs. 20	30
Rs. 25	15
Rs. 100	10
Rs. 150	5
No answer	10

13. Rating on Faculty Effectiveness

Name of Faculty	Per cent of Participants Rating (N:20)					Weighted Rating
	Very good	Good	Fair	Unsatis- factory	No Reply	
Mr.Sterenber	-	70	25	-	5	0.9
Dr.Sivakumar	5	65	25	-	5	0.9
Mr.T.M.K.Varma	5	70	20	-	5	0.9
Mr.R.Ramamurthy	65	35	-	-	-	1.4

Rating for weighted Average.

Very Good	: 3
Good	: 2
Fair	: 1
Unsatisfactory	: 1

