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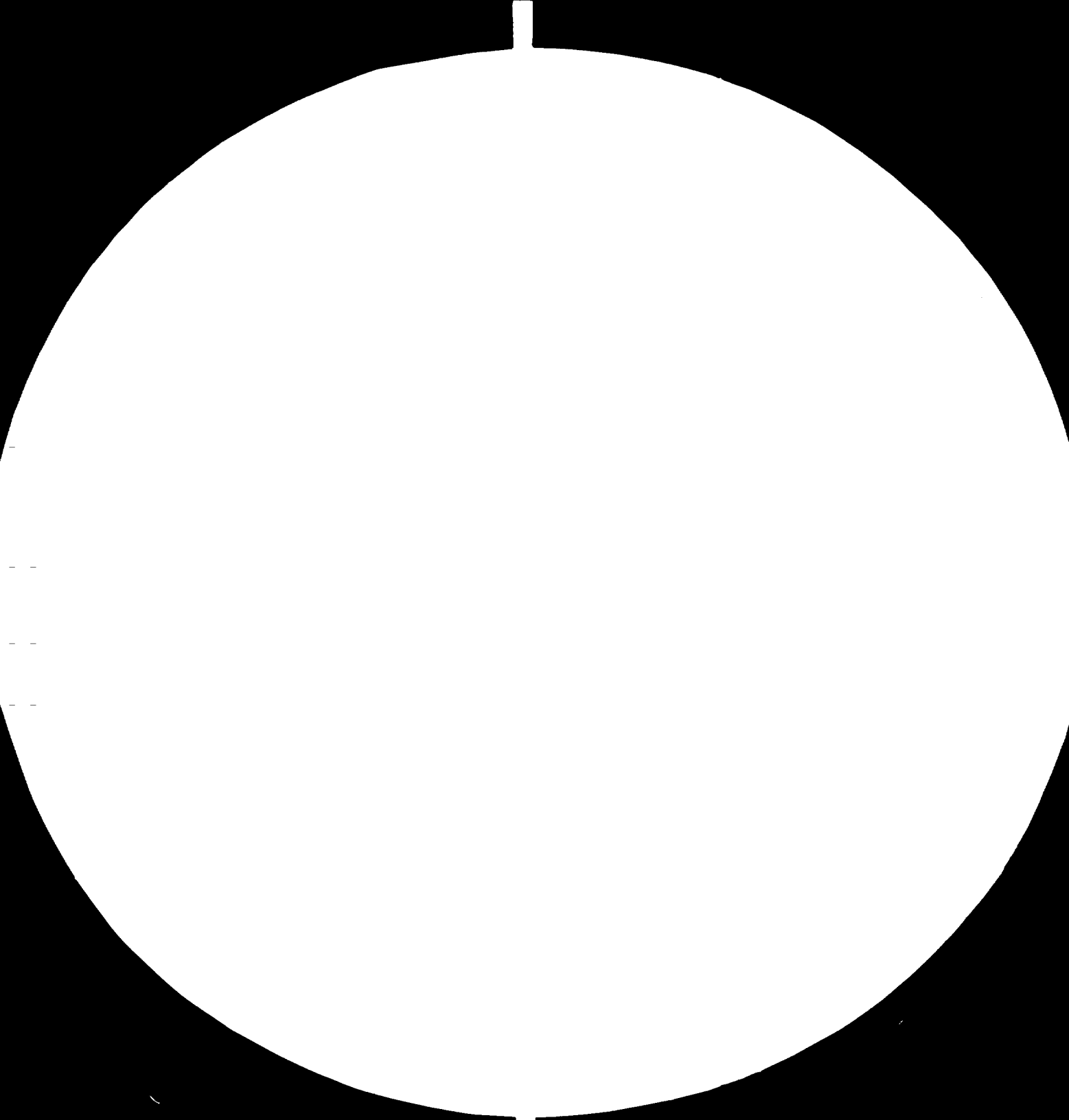
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9 June 1982
English

TEXTILE DEVELOPMENT CENTRE, PHASE II .

DP/EGY/77/008

EGYPT

Technical report: Knitting technology (Part 2) *

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

Based on the work of M.S. Burnip, Knitting expert

003122

United Nations Industrial Development Organization
Vienna

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<u>CONTENTS</u>	<u>Page</u>
Explanatory Notes	1
Abstract	2
INTRODUCTION	
A The Textile Development Centre	3
B The Knitting Expert	3
C The Nature and Duration of the Assignment	4
I FINDINGS	
A Equipment	5
B Staff	5
C Staff Development	6
D Progress with Applied Research and Development Programme	6
E Visits	7
F Other Activities	8
II RECOMMENDATIONS	
A Equipment	9
B Staff	9
C Staff Development	10
D Seminar Programme	12
E Research and Development Programme Phase II	13
F Other Activities	13
<u>ANNEXES</u>	
I Programme of Expert	15
II Additional Items of Equipment and Spares	17
III Staff Development Initial Training Programme in the Making Up of Knitted Goods	19
IV Training Course in Knitting Technology for Junior Engineers	20
V Applied Research and Development Programme in Knitting Technology Phase II	22
VI Seminar Programme	26

EXPLANATORY NOTES

Reference to the Textile Development Centre (TDC) or simply the Centre means the Centre set up at the Textile Consolidation Fund premises at El Siouf, Alexandria.

The Cotton Textile Consolidation Fund is an ARE organisation for the development of the textile industry with branches in Alexandria and elsewhere, with a head office in Cairo. CTCF carries out testing and quality control for industry, especially in relation to exports, at its Testing and Quality Control Centre TQCC.

ABSTRACT

This report covers the second of a series of assignments related primarily to machine knitting at the Textile Development Centre, Alexandria. The report covers an appraisal of progress made since the previous assignment in August 1981; the development of training courses and the determination of a further phase of the applied research and development programme.

The report concludes that a more professional approach to research and development activities must be developed by staff and suggests means by which this may be encouraged.

It is noted that deficiencies in equipment are hampering the work of the section and recommends that efforts are made to provide specific items as soon as possible.

It concludes there is a need for integrative staff development aimed at providing a team of experts capable of critical analysis of all stages of a problem.

INTRODUCTION

A The Textile Development Centre

The background to the setting up of the Centre was detailed in DP/ID/SER.A/316 1 October 1981. The objectives of the Centre are to:

- (i) provide pilot plant and testing laboratories for work on industrial problems of immediate use to the textile industry;
- (ii) carry out pilot plant studies of materials, particularly cotton and its blends, including fibres, dyes, finishes, machines and processes;
- (iii) carry out qualitative and operational studies on industrial processes in textile mills to increase productivity and efficiency;
- (iv) provide technical consultancy in management and technological problems and to extend modern testing techniques to industry;
- (v) communicate to industry at all levels by organising seminars, conferences, symposia, group discussions and training courses;
- (vi) disseminate technical information to industry; and
- (vii) assist the industry to set and maintain standards.

B. The Knitting Expert

The requirements of the expert in relation to knitting technology were specified in the first report referred to above. In particular the extension of research activities into the knitting field, advice to industry and the development of courses for industry were

specified. The assignment has also subsumed previous responsibilities for warp knitting as well as weft knitting.

C. The Nature and Duration of the Assignment

This report refers to the second assignment of three covering the period of April 1982.

The expert's programme for this assignment is given in Annexe I but the objectives were as follows:

- (i) to review the work of the knitting department since the previous mission;
- (ii) to help the knitting engineers to finalise their reports;
- (iii) to plan and initiate further experimental work in knitting especially warp knitting at KABO;
- (iv) to give a short course on knitting technology to mill engineers;
- (v) to plan a mainly practical course in knitting to be given by the TDC staff to mill personnel at a later stage;
- (vi) to organise a seminar to be given by the knitting engineers to their colleagues; and
- (vii) to write a mission report.

I FINDINGS

A Equipment

No changes in the equipment available to the knitting section had taken place since the previous mission, except that two small circular machines previously in another laboratory were transferred to the knitting laboratory, but only one of them was equipped with a motor.

The recommendations for additional equipment as detailed in the first mission report (Annexe II and the more urgently needed items report page 9) were accepted by the Centre, but no attempts had been made to secure any of the items. More importantly since it influences the immediate usefulness of equipment, none of the list of spares detailed as being required on the previous mission had been ordered.

Whilst there are no doubt reasons for this, nevertheless it has and will restrict the work of the department severely. The need for the spares and the items of equipment is now more urgent. To aid decisions on this matter the list of more urgently required items was revised and put into priority order. The full list and the priority items are listed in Annexe II.

B Staff

The number of staff remained fixed at three engineers dealing essentially with the testing of knitted fabrics and warp and weft knitting respectively. One of the staff was however assigned on a

part time basis to the weaving section whose staff were abroad on training courses. There were still no technician staff assigned to the section.

C Staff Development

A review of work done since the previous visit suggested that the staff whilst engineers have little experience of organised research and development, or of the planning and writing up of technical reports. Some steps to improve on this situation were taken during the visit by discussions with the staff and by rewriting in full of two reports on work carried out since the last mission. Suggestions in relation to staff development made under IIC of the previous report had not been acted upon. Further recommendations are made on this topic later in this report.

D Progress with Applied Research and Development Programme

An applied research and development programme (Phase I) was included as Annexe III of the previous report (DP/ID/SER.A/316 1 October 1981) and a major objective of the present mission was to assess progress with this programme. Only a limited number of the projects had been completed and reports had been written only upon two of them.

It was clear that staff had learnt from these exercises, but a disappointing level of professionalism was associated both with the conduct or reporting of the work. As a consequence it would be unwise to consider any of them as adding to the store of knowledge

about warp and weft knitting, but instead it is hoped that staff have appreciated the purpose of a series of exercises designed to improve their understanding and develop their ability to undertake more substantial tasks.

A number of organisational and servicing tasks in connection with the running of the department had been effected, but these were to some extent hampered by the lack of spares and other items requested.

E Visits

Visits were made to two companies, firstly to one of the knitting and making up companies in the public sector to discuss the trial on the warp knitting of spun yarn outlined in A2 of Annexe III of the previous report. This work had not been carried out, nor in fact had its implementation been discussed with the company since the previous visit. Two visits were made to the company who admitted the problem had worsened to the point where ninety per cent of the products were now seconds. The company was about to purchase new machinery, but it was stressed to them that the fundamental problem would remain even with new equipment. It was agreed that the company wished the trial to go ahead on the basis proposed by the Centre.

The other visits to another public sector company were concerned with the possibility of floating a new venture into knitting and making up with a partner from the Western Countries. Some advice,

by way of a checklist of information any potential business partner would require was prepared by this expert and Dr R Nield the project leader. The company accepted the advice and agreed to make available the information requested to potential partners.

F Other Activities

One of the main purposes of this visit was to provide a seminar programme for industry and staff at the Centre in knitting technology. This was carried out in the form of a 2 day course taught by the expert. The Centre is intending to publish the collected papers of the course for the benefit of the industry. The programme of the two-day course is given as Annex VI.

II RECOMMENDATIONS

A Equipment

The previous report highlighted the need for both additional equipment and spares if the knitting section was to fulfil adequately the function required of it. Recommendations for pertinent equipment for a number of areas totalling at estimated (1981) prices some \$418,000 were made covering: weft knitting machinery (\$185,000); warp knitting machinery (\$80,000); warping (\$100,000); finishing (\$71,000); and testing (\$19,000). Also provided was a list of the most urgently required items totalling \$172,000. Whilst appreciating problems over budgets for the project it is nevertheless felt that this equipment together with spares valued at \$2,500, is required if the project is going to make any progress and if the investment made to date is to be fully utilized. It is felt that elements of this equipment and certainly the spares could be funded by the Textile Development Fund since without the necessary equipment much of the effort both of experts and local staff is dissipated. An updated list of the spares was given in a memorandum dated 20 April 1982 to the project manager. A copy of a revised list of urgent items in prioritized order is given in Annexe II.

B Staff

The previous report (DP/ID/SER.A/316 1 October 1981) noted that the knitting section had three engineers, but no technician staff or other staff. It made the recommendation that "steps are taken to engage at least one technician who could be trained on machine adjustment and maintenance as soon as possible". That recommendation is reaffirmed. The previous report also commented that consideration

whether other staff requirements 'including that of more senior staff will be necessary when the applied research and development programme becomes operational'. In view of the limited progress towards the fulfilment of the applied research programme this matter is not commented upon further at this stage, but will be returned to in a later report.

C Staff Development

It is clear from progress made to date that the staff of the knitting section whilst qualified engineers with, in some cases, postgraduate qualifications or current University teaching experience, have little perception of the rigour, thoroughness and objectivity it is necessary to apply continuously to the pursuit of research and development. Efforts made by the project manager and the author last year to develop a seminar series for the purpose of critical self-appraisal and constructive criticism of projects have not succeeded, nor have the fundamentals of programme planning and report writing.

Accordingly two reports were written as models to be followed and a number of projects developed in the applied research programme with these objectives in mind. Some of the suggested tasks will offer the opportunity to plan the project from the outline given, with a view to further scrutiny before implementation.

It is however recommended that steps be taken to institute a regular seminar series for the purposes of staff development along the lines proposed in section IIC of the previous report. It is further

recommended that these involve all Textile Development Centre staff since valuable cross disciplinary connections and perspectives can so be generated. It is also recommended that equivalent staff from the Textile Consolidation Fund be involved so that testing routines proposed as part of research and development programmes are seen to be a natural extension of the duties of such staff and not additional work to be accommodated.

To ensure that such a programme of staff development is effective it is recommended that its organisation and implementation become the responsibility of a senior management member.

An area of staff expertise which is currently lacking in the knitting section and at the Centre at large is that of making up of knitted goods. One junior engineer has received some training under a previous UN expert Mr H Hollmann on the making up of woven fabric and should in due course be able to advise and operate equipment for the making up of woven goods. It is suggested that there is a similar need for such expertise in relation to the making up of knitted goods and it is further recommended that staff training programmes in the making up of knitted goods are implemented before the visit of the proposed UN expert in the making up of knitted goods. To enable expertise in the evaluation of knitted garments to be achieved as well as expertise in making up it is recommended that both Engineer S Sief El Nasr and junior Engineer N El-Attar should undertake such a course of training. A possible

training programme which should be further discussed with whichever industrial firm is used to provide the training and further detail added on their advice is given in Annexe III.

D Seminar Programme

To assist the industry and the staff at the Centre in their understanding of modern knitting technology a two day course was arranged and conducted by the expert on 18 and 19 April 1982. The programme for the course is given in Annex VI. The collected lectures are to be issued by the Centre in bound form to aid engineers and others in industry and at the Centre.

In addition a training programme for young engineers was devised to be given by the staff of the knitting section involving a combination of lectures and practical work. This course was devised to utilize all the engineers concerned with knitting and is expected to act as a basic course from which other more specialist courses will be developed later. The programme for this course is given in Annexe IV.

It is recommended that the staff mount the course before the next visit of the expert so that an evaluation of it can be made and further programmes devised. It is also recommended that staff produce written lectures or detailed notes in advance since this will ensure adequate preparation and elimination of overlap is achieved.

E Research and Development Programme Phase II

In developing a further phase of an applied research and development programme for the section it has been taken into account that few items were completed from the first programme; that the trial involving the warp knitting of spun yarn had not been undertaken, but that the Company wished the Centre to assist them by carrying this out; that there was a need to include a number of exercises whose purpose could be regarded as professional development of staff; that if the staff are to mount a training course for industry some of the tasks could usefully relate to some of the necessary practical work for that course.

The second phase of the research and development programme is given in Annexe V. The detail was discussed with staff during the mission and the purpose and plan for the next phase discussed with the project manager.

F Other Activities

The need for staff to keep up to date by reading of published work was stressed. From use made of the library by the expert in the course of preparation of lectures it was disappointing to

find the non-availability of a number of issues of journals reported to be taken. It was also disappointing to find that a set of the author's own collected papers some of them relevant to the tasks staff had been asked to carry out, had not been made available through the library to the staff of the section. A copy of the author's recent keynote paper to the New Zealand section Textile Institute Conference in December 1981 was added to the collection of papers donated to the Centre.

ANNEXE I

Programme of Expert

April 1982

- 4 Travel from UK to Cairo
- 5 UNDP Briefing/Travel to Alexandria

Visits

- 11 United and Arab Spinning and Weaving Co
- 11 El Nasr Clothing and Textiles Co (KABO)
- 15 El Nasr Clothing and Textiles Co (KABO)
- 20 United and Arab Spinning and Weaving Co

Seminars

- 17 Weft Knitting Technology
- 18 Weft Knitting Technology

Activities Covered

Lectures Written for Publication

- (i) The UK Knitting and Clothing Industries : A Case Study
- (ii) Developments in Circular Knitting Machinery
- (iii) Developments in Flat Knitting Machinery
- (iv) Computer Aided Textile Design for Knitting Machinery
Parts I and II
- (v) Factors Affecting the Design of Circular Knitting Machinery
Parts I and II

Fabric Sampling

Trials

Review of : Warp knit fabric trials;
Weft knit fabric trials.

Warp Knitting of Spun Yarns (in conjunction with industry)

Equipment and Spares

Discussions re future equipment requirements and spares requirements.

Research Programme

Review of progress made
Production of exemplar project reports
Development of further stage of research programme

Training Programmes

Development of training programmes for staff
Development of training course for staff to give at Centre
for industry

April

21	Travel to Cairo
22	UNDP/Travel to Vienna
23	UNIDO Debriefing
24-31	Report Production

ANNEXE II

The previous report highlighted \$172,000 worth of equipment as being essential.

These pieces of equipment were:	\$
Handflat machines	20,000
Interlock machine	50,000
Warp knitting machine (table top version)	15,000
Warper (hand operated)	10,000
Tubular callendar	60,000
Wascator automatic washer	5,000
Tumble dryer	3,000
Cubex Washing machine	3,000
Pilling Tester	3,000
Snagging Tester for knitted fabric	3,000

Whatever the availability of funds these remain essential.

To them should be added:

Yarn hairiness meter (Shirley model)	13,000
Drapemeter (Cusick model)	4,000

TOTAL \$189,000

The order of priority for these items is as follows:

<u>Item</u>	<u>\$</u>	<u>Running Total \$</u>
1. Handflat machines	20,000	20,000
2. Wascator automatic washer	5,000	25,000

<u>Item</u>	<u>\$</u>	<u>Running Total \$</u>
3. Tumble dryer	3,000	28,000
4. Pilling tester for knitted fabric	3,000	31,000
5. Snagging tester for knitted fabric	3,000	34,000
6. Drapemeter (Cusick model)	4,000	38,000
7. Yarn Hairiness Meter (Shirley model)	13,000	51,000
8. Cubex washing machine	3,000	54,000
9. Interlock knitting machine	50,000	104,000
10. Table top warp knitting machine	15,000	119,000
11. Table top warper	10,000	129,000
12. Tubular callendar	60,000	189,000
	<hr/>	<hr/>
	\$189,000	\$189,000

ANNEXE III

Training Programme in the Making Up of Knitted Goods

Departments of Functions to be Covered

1. Finished Fabric Receipt and Inspection (plus any refinishing or callendering operations)
2. Garment Design
3. Pattern Grading, Marking and Lay Planning
4. Laying Up and Cutting
5. Sewing and Linking
6. Finish pressing, examining and packaging
7. Quality Control and Testing

An initial course might be accomplished in say three (3) weeks, with a further more detailed course lasting say eight (8) weeks to take place subsequent to the visit of the UN expert in the making up of knitted garments and planned by him.

The preliminary course could be divided up as follows:

Items 1,2 and 3	Week 1
Items 4 and 5	Week 2
Items 6 and 7	Week 3

Textile Development CentreIntroductory Course in Knitting Technology

By Knitting Technology Staff : Eng S. Seif El-Nasr.
 Eng M. Ali.
 Eng M. Shemi.

Day 1. Introduction

09.30-10.30	The Egyptian Knitting Industry	Eng S. El-Nasr.
10.30-11.30	Classification of Knitting Machinery and Knitted Products	Eng S. El-Nasr.
Break		
12.00-13.00	Principles of Weft Knitted Structures.	Eng M. Ali.
13.00-14.00	Analysis of Weft Knitted Structures.	Eng M. Ali.

Day 2 Warp Knitting and Weft Knitting Mechanisms.

09.30-10.30	Principles of Warp Knitting mechanisms.	Eng M. Shemi.
10.30-11.30	Examination and Operation of Warp Knitting Machinery.	Eng M. Shemi.
Break		
12.00-13.00	Principles of Weft Knitting Mechanisms.	Eng M. Ali
13.00-14.00	Examination and Operation of Weft Knitting Machinery.	Eng M. Ali

Day 3 Warp Knitted Structures and Weft Knit Fabric Geometry

09.30-10.30	Principles of Warp Knitted Structures.	Eng M. Shemi
10.30-11.30	Analysis of Warp Knitted Structures.	Eng.M. Shemi
Break		
12.00-13.00	Principles of Weft Knitted Fabric Geometry (1)	Eng S. El-Nasr
13.00-14.00	Production of Fabric Geometry Samples for Testing.	Eng M. Ali

Day 4. Fabric Geometry and Weft Knitted Structures.

09.30-10.30	Principles of Fabric Geometry(2)	Eng S. El-Nasr.
10.30-11.30	Use of Instruments to Set up Circular Knitting Machines.	Eng M. Ali
Break		
12.00-13.00	Weft Knitted Fabric Structures(2)	Eng M. Ali
13.00-14.00	Fabric Analysis (2)	Eng M. Ali

Day 5. Knitted Fabric Testing and Warp Knitting

09.00-10.30	Testing of Weft Knitted Fabrics	Eng S. El-Nasr
10.30-11.30	Testing of Weft Knitted Fabrics Practical.	Eng S. El-Nasr
Break		
12.00-13.00	Production and fitting of pattern chains to warp knitting machines.	Eng M. Shemi
13.00-14.00	Setting up of let-off and take-up motions and production of warp knitted fabrics.	Eng M. Shemi

Day 6. Fabric Geometry and Testing of Warp Knitted Fabrics.

09.30-10.30	Fabric Geometry Analysis of Fabric Samples.	Eng S. El-Nasr
10.30-11.30	Knitted Fabric Faults; recognition, rectification and prevention.	Eng M. Ali
Break		
12.00-13.00	Warp Knitted Structures (2)	Eng M. Shemi
13.00-14.00	Testing of Warp Knitted Fabrics	Eng S. El-Nasr

- Notes:
1. The course is intended for engineers with up to three years experience, employed in warp knitting weft knitting, testing or garment manufacturing from knitted fabrics.
 2. The course will include some practical studies and is therefore limited to 12 persons.
 3. Depending upon demand the course can be repeated a number of times.
 4. Depending upon responses following the course, further more specialist courses could be developed in : (i) Warp Knitting; (ii) Weft Knitting; and (iii) Testing of Knitted Fabrics.

ANNEXE V

Applied Research and Development Programme in Knitting Technology

Phase 2

The following items specified in the first report remain uncompleted.

Warp Knitting

1. Development trials on the warp knitting of spun yarns in conjunction with El Nasr Clothing and Textile Company (KABO) incorporating work on the clearing standards for spun yarns - to progress in accordance with a detailed programme drawn up for this purpose and left with staff.
2. The development of yarn suitable for warp knitting : a trial involving ring spun and open end spun yarns in cotton, but produced with different values of twist factor, hairiness, clearing standards and yarn lubrication.

Weft Knitting

3. The geometry and dimensional properties of plain knitted fabrics produced on the FAK machine from different types of Egyptian cotton viz Giza 71, 72, 78 etc with the objective of determining whether different amounts of shrinkage are induced by different types of cotton. Dependent upon the results, this work could be extended to cover blended Egyptian cottons.

Testing

4. Assessment of yarns in connection with development trial on warp knitting of spun yarns at KABO.

Spinning

5. The development of a yarn suitable for warp knitting as specified in (2) above.

Miscellaneous

6. The development of a collection, classification, analysis and rectification system for faults in warp and weft knitted fabrics.

The following additional items of applied research and development should be carried out.

Warp Knitting

7. The production of a range of standard raschel knitted fabrics on the RM6F raschel machine for the purpose of providing a training in systematic experimental design, analysis and testing. The structures to be produced should include all of those specified in the tricot knitting trials specified earlier.
8. The warp knitting of open-end spun yarns on the raschel machine, using the knowledge gained from (7) above to produce beams and fabrics from open-end spun yarn.

Weft Knitting

9. The effect upon fabric loop length, dimensions, appearance and shrinkage after washing of different methods of setting the machine to produce a given loop length.

10. The effect of machine speed upon fabric loop length.
11. The operation of the storage feed system as a positive feed and the calibration of the positive feed system.
12. The production of interlock fabric samples to a range of loop lengths knitted from cotton yarns to enable the geometry and shrinkage characteristics of interlock to be determined.

Testing

13. The testing of the warp knitted fabrics produced in (7) above with statistically sound testing and analysis.
14. The testing of fabrics produced in (9) above.
15. The testing of fabrics produced in (12) above.
16. A comparison of test methods for the assessment of fabric shrinkage, including the use of domestic laundering techniques.
17. An investigation of hosiery yarns produced in the Egyptian spinning industry, their testing and classification, followed by sample knitting on the FAK machine and appearance ranking of fabrics.
18. An investigation of methods for the estimation of lubricant content, frictional measurement and lubricant types for knitting yarns of cotton, cotton-man made fibre blends or man made fibres including filament and textured filament yarns.

Miscellaneous

19. A study of the size, structure, distribution and product value of the Egyptian knitting sectors.
20. The development of a collection of fabric samples produced in the Centre and in industry for all types of knitted products.

TEXTILE DEVELOPMENT CENTRE

Short Course in

WEFT KNITTING TECHNOLOGY

By

DR M. S. BURNIP

UNIDO Knitting Consultant

Textile Quality Control Centre, Gamila Buhreid Street,
El Siouf, Alexandria on 17 & 18 April 1982.

Programme17 April 1982

- 10.00 - 10.15 Welcome and Introduction by Dr R Nield, Project Manager.
10.15 - 11.00 The UK knitting and clothing industries - a profile. Dr Burnip.
11.00 - 11.45 Spinning yarns for knitting - Mr J Shaw, Spinning Expert.
11.45 - 12.00 Break.
12.00 - 12.45 Development in circular knitting - Dr Burnip.
12.45 - 13.30 Development in flat knitting - Dr Burnip.

18 April 1982

- 09.45 - 10.30 Computer aided design for circular machinery (1) - Dr Burnip.
10.30 - 11.15 Computer aided design for circular machinery (2) - Dr Burnip.
11.15 - 11.30 Break.
11.30 - 12.15 Factors affecting the design of circular knitting machinery (1) - Dr Burnip.
12.15 - 13.00 Factors affecting the design of circular knitting machinery (2) - Dr Burnip.
13.00 - 13.30 Discussion on research and training courses at the Textile Development Centre. - Dr Nield (Chairman)

