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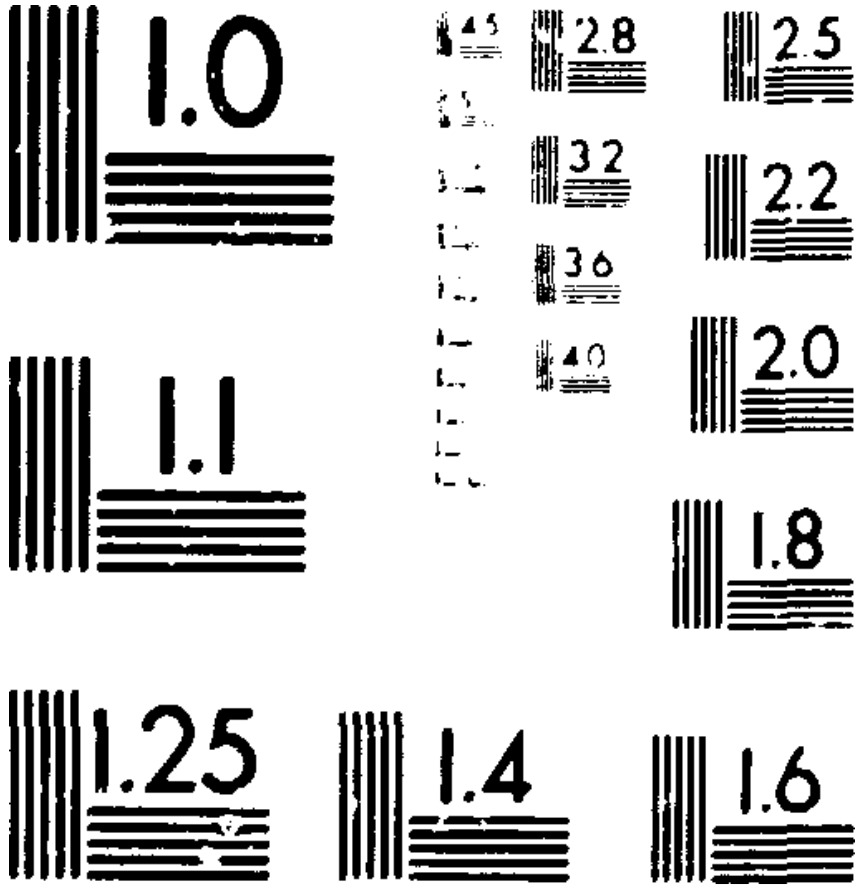

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6 July 1984
ENGLISH

DEVELOPMENT OF HOSIERY AND KNITWEAR INDUSTRY, LUDHIANA (PUNJAB), PHASE II

DP/IND/82/006

INDIA

Technical report: Circular Knitting*

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 Malcolm J. Bithell,
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United Nations Industrial Development Organization
Vienna

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TABLE OF CONTENTS

1. Introduction

The circular knitting industry in Punjab State is, for the most part, equipped with relatively simple, locally built machines producing reasonable quality fabrics. There is a strong move by a number of manufacturers to import modern machinery to improve their ranges and thus satisfy more sophisticated markets. The purpose of this 4 months assignment was two-fold:

a) to examine the wider industry i.e. both machine builders and knitters, with a view to advising on the updating of equipment and assisting, where possible, manufacturers who had problems either of a technical nature, or in selecting machinery suitable for their requirements;

b) the training of the Facility's staff in all aspects of the operation and maintenance of the two circular body-length machines provided by UNDP/UNIDO, so that they may become a resource for the industry, both as a supplier of designs and fabric not previously possible and a provider of technical assistance for circular knitters.

The staff of the Knitwear Facility were of great assistance in the first part of the assignment, providing necessary background information on the companies visited as well as direct assistance at interviews.

Informal training to achieve the second objective consisted of practical assignments to enable the staff to become fully conversant with the function and operation of the components of the machines and intensive instruction in the preparation of patterns and designs and the technique of reproducing these as garment lengths. The success of this training was reflected by the fact that the staff have produced samples entirely unaided and, although difficulties must and will occur, the staff have demonstrated their ability to analyse problems and make the necessary adjustments to overcome them.

2. Review of the Circular Knitting Machine Builders in Ludhiana

In the company of the Knitting Mastre of the Knitwear Facility three circular machine builders were visited:

M/s Raj Mechanical Works
Industrial Area

M/s Bharat Mechanical Works
Industrial Area-A

M/s Punjab Machinery Works
G.T. Road, Millerganj

At each company discussions were held with the management regarding the types of machinery they produce, their perception of the market in which they operate and their ideas for the future in circular machine building. In each case we were given a conducted tour of the plant to examine in production methods and machines in all stages of production.

The machine types built fall into 3 categories:

- Open top or sinker body machines;
- Interlock machines;
- Plain rib machines.

Each of these types is built to a greater or lesser degree by the manufacturers concerned, depending on orders received. Diameters range between 14 and 30 English inches in gauges upto 26 NPI. The fact that such fine gauges are produced speaks highly for the technical competence of the builders and although the machines are of a somewhat old design they apparently perform well enough for the purposes of local fabric manufacturers.

An immense price advantage for the locally produced machine over new or even second-hand imported machines is an added incentive to buy the local product.

It is apparent, however, that many Ludhiana Knitters are installing more sophisticated imported machinery in an effort to produce for the fashion fabric market both at home and abroad. These markets demand a high standard of fabric quality with little deviation from specifications and I doubt that the locally built product would be able to achieve this standard in its present form.

I believe that local machine builders could capture a portion of this market by the gradual adoption of a development programme which would make their product more compatible with those from overseas.

See Recommendations - Circular Machine Manufacturers.

3. Recommendations

The following are suggestions for Circular Machine Manufacturers. Some of these suggestions may already be under consideration or be implemented by some machine builders:

1. That all machines of large diameter - 26" and above be equipped with dogless drive and be built on a tripod base to provide greater stability and easier adjustment.

2. That new technology "meander" type needles be fitted to enable higher machine speeds to be attained with less needle breakages.

3. That improved individual yarn stop-motions be used with a "plug-in" facility to assist removal and replacement in the event of a malfunction.

4. That creel type cone stands be used for multi feed machines. Although they take up more floor space they are more accessible and, when knitting spun yarns, produce less "fly" above the machine. Machine down-time is also reduced because "tailing-up" of cones is easier.

5. That feed wheels and adjustable tape drives be developed or purchased so that machines can be equipped with tape-type positive feed systems. Such systems are much cheaper than the storage type positive feed currently offered (see note) and would, if made compatible, provide a source of spare parts for existing machines.

Note: The price quoted for one only imported storage/positive feed unit is approximately Rs 700 plus electrical components. This could, in the case of a multi-feed machine, represent a greater cost than the machine itself.

Consideration should also be given to the following:

a) The development of "Key" or "fixed battery" type pattern units with multi-step jacks to provide machines with greater pattern and stitch scope.

b) The development of 3 thread fleecy machines to capitalize on the worldwide popularity of this fabrics (track suits and other sportswear).

c) The development of striping units for open-top machines to produce striped fabrics for shirtings, dress-goods, etc.

4. Review of Circular Knit Fabric Producers

A number of circular knitting organizations were visited (See Annex D) and many of these availed themselves of the opportunity to discuss technical problems.

Advice as to machine types and makes suitable for various products was also sought and given.

Machines of all types from many different overseas builders are being installed in many plants with the attendant difficulties of obtaining and training staff who can cope with the complexities of machines formerly quite uncommon in this country.

My observations lead me to believe that the operatives of many companies will require special training in the function and operation of many machines and their components. I believe that the staff of the Facility must continue to be available to advise the industry and that the industry will seek their advise even more in the future.

This will be a difficult task because of the diversity of the machines being introduced but, in my opinion, the Knitting Staff at the Facility are more than competant in this regards.

5. Recommendations for the Assistance of Circular Knitters

1. That the Facility consider offering training packages in two forms:

   a) Machine knowledge courses at the Facility which should be "hands-on" training in various areas such as positive yarn feeding, striping on circular machines, the operation of body-length machines, selecting mechanisms and stop-motion adjustments, etc.

   b) "On-site" training and advice, where Facility staff visit manufacturers to instruct informally on technical problems which may be encountered especially on new machinery.

Both these programmes should be on-going and should be available when and where required. It is essential that any programme represents a response to a need and manufacturers should be encouraged to communicate their particular needs to the Facility's staff.

2. That the Facility's staff be encouraged to visit fabric producers as often as possible to discuss production problems and also to advise on the purchase of machinery suitable for the producers own particular requirements. This should stress the inadvisability of purchasing machines from a variety of different manufacturers.

6. The Training Programme for Circular Bodylength Knitting Machines at the Facility

The Knitting Master Mr. Manjit S. Malhotra and the Circular machine operator Mr. Surinder Singh commenced the actual training programme on both the RTRM and SPJM on the arrival of the Bentley Engineering Company's service engineer on Thusrday 8 March 1984.

Familiarity with machine parts such as stop motions, guides, threading and take down systems was established by the staff working closely with the erector.

Some difficult obtaining Polyester or Nylon yarn to be used as a backing for the terry pattern which was set up on the RTR had to be overcome before this machine could be trialed completely but the SPJ was trialed and set on to its original pattern.

This particular pattern was 5 tuck presser foot design and after consultation with the erector I decided it would be advantageous to remove the presser feet from this machine. The reason for this action is that the presser feet, when fitted, require the machine to be functioning perfectly in every respect or damage to many needles may occur and as the machine was in the hands of relatively inexperienced people (on this type of machine) and training had to be affected, their removal was desirable, if not imperative.

These parts are able to be refitted by the staff but I have strongly recommended that they do not do so unless it is absolutely necessary. Any designs which require presser foot stitches can be more easily made on the Dubied JDR 2 flat machine.

Component repair and maintenance

The training strategy adopted to familiarise the staff with the various machine components and mechanisms was to have them remove a component, examine its operation and strip it down completely. This was followed by discussions regarding the trouble which could be expected from the various components and the probable remedy, followed by the re-assembly of the part and the installation and checking of its operation.

All eventualities cannot be predicted, of course, but I believe the staff are now as capable of overcoming machine malfunctions and breakdowns as the comparatively short training time would allow.

Machine components setting:

Some difficulties were experienced with various machine functions during the course of sample production. These difficulties were most often due to slightly incorrect settings of some components and were corrected under my instruction by the staff. Component settings were discussed in depth and the means of checking settings was also explained. The staff have demonstrated their capabilities in this regard by diagnosing subsequent problems and making the necessary adjustments correctly.

Pattern designing and control chart planning:

Due to complexity of the machines involved, particularly in the area of pattern and stitch design possibilities a great deal of time was devoted to the preparation of graphs and the cam settings required and the preparation of a control chart from which the programme would be made.

Although both machines have similar patterning and control systems they each have their own pecularicies as far as design scope and stitch possibilities are concerned and must be treated quite differently when designing patterns.

Intensive instruction was undertaken to ensure the staff were familiar with all of the following (see also Annex A):

a) Design possibilities - this was achieved by co-producing samples with all possible basic constructions on each machine. This ensures that the staff has a reference point for similar patterns in the future.

b) Pattern cutting - after graphing, instruction was given in interpreting the graphic instructions on to Mechatape film.

c) Chart planning - this is probably the most important aspect of patterning as it involves the transferring of all previous data onto the machine.

The staff have demonstrated their capabilities in all of the above by successfully producing samples of their own design and without assistance.

Additional advise and assistance was also given regarding circular knit garment production on the following topics:

The determination of the optimim loop length on circular body length machines	See Annex B
Methods of establishing piece running times	See Annex C

7. Programme Outline for Training on Circular Bodylengths Machines

Basic machine features:

Cam boxes and plates and their controls
quality adjustments
threading
stop motions - operation and setting
chain control mechanism
take-down rollers
Cardomatic and Mechatape operation
element changing
lubrication

Operating practices - RTR8M:

Shogging mechanism operation and setting
stitch transfer operation and setting
stripper operation and setting dial
height, timing and gating adjustments
press-off restart procedure, control
lever operation
Mechatape and Cardomatic setting and operation

SPJ8M:

Cam functions and operation
quality control operation and setting
double selection pattern system operation
striping hook operation and setting
press-off restart procedure
control lever operation

Lubrication and preventative maintenance:

Lubrication points and types of lubricants
frequency of lubrication (from machine hand book)
hints on maintenance practices

8. Future Work Programme

Because the Facility is being called upon to produce samples from garments supplied by customers as well as develop their own range of patterns a rigid work programme is difficult to devise.

I would, however, recommend that the following be given ernest consideration:

a) that continuing discussions be held with garment manufacturers to ascertain their needs and projected needs in regard to future patterns and styles;

b) the insistence that, in the initial stages at least, customers be encouraged to provide accurate ideas as to their sample requirements. Although the Mechatape system is not costly to sample on much time can be wasted in experimentation when customers have no clear idea of these requirements;

c) the gradual development of an internally generated sample range to continually up-date the existing range and provide the industry with a source of new material with which to produce garments and to demonstrate the versatility and productivity of circular body-length machines.

Based on the experiences obtained by carrying out the foregoing recommended tasks the staff of the Knitting Department should be able to devise a systematic and meaningful plan of activities.

9. Recommended Spare Parts Required for SPJ 8M 8gg 22" Dia No. 34992

Part No.	Description	Qty. Reqd.
SP4515	Slider guard cam spring	6
S3583*	Cardomatic pin washer	20
C2473	Verge bits	50
SP5266	Striper spring	20
S5230	Striper spring	20
S3204	Striper compression spring	20
S3329	Striper spring	10
21891	Bolt cam spring	20
21312	Bolt cam catch spring	20
S5543/3	Quality lever spring	20
SP3824	Locking piece	20
Z2463	Screw	5
SP5446*	Shear pin	5
SP5347*	Drive pin	5
C5472	Striping hook	10
Z2004	Quality catch spring	10
SP4515	Slider guard cam spring	6
SP4417	Bolt cam lever	1
SP4418	" " "	1
SP3774	" " "	1
SP3776	" " "	1
Z183	Screw (cheese head)	6
Z2278	Washer	6
C994	Bolt cam bottom welt	
C8306	" " tuck	
C5493	" " top welt	
C4500	" " top transfer	
SP4514/22"	Latch guard 8N/J	2
C5494	Latch guard bracket	1
C7870*	Presser slide	6
D3015*	Selector lever	6
D8327	Trans. isolation lever	2
D3055*	Selector lever (long nose)	6
D3056*	Selector lever (short nose)	
No number available	Compression spring for transfer presser cam	6
S5782*	Torsion spring	6
C9589	Cable assembly, welt slide	1
C7394	" " mech a tape	1
S6038*	Compression spring	6
E9407	Cut presser 1-73	20 each
* Evo-stik impact adhesive		6 tubes
* Graph pad 1/10"		12 pads

Note: Parts marked * are common to both machines.

10. Recommended Spare Parts Required for RTR 8M 14gg 22" Dia No. 35783

Part No.	Description	Qty. Reqd.
Z2082	Tension spring	6
Z2184	" "	6
S3609	" "	6
Z2551	Torsion spring	6
Z2550	" "	6
Z2154	" "	6
Z2153	Spring	6
Z2183	"	6
Z2181	Tension spring	6
Z2155	Torsion spring	6
Z2182	Tension spring	6
Z1516	Spring	6
S3427	"	6
C9205	Cable assembly mechatape	1
C9208	Cable assembly welt side	1
C9202	Cable assembly shog	1
B7906	Flat spring	6
Z2699	Dial quality screw	6
Z992	Dial quality locking screw	6
Z8154	Cut presser 1-73	20 each
S2057	2BA x 5/16" cup pt. screw	6
10910	Lock plate	2
Z2326	10 x 32 x 5/5" grub screw	4
Z2704	10 x 32 x 1/4" grub screw	4
259/974	Lock plate	2
Z2699	8 x 32 x 1" cheese hd. screw	4
Z992	8 x 32 x 1/4" cheese hd. screw	4

11. Recommendations for Improvement of Equipment etc. for the Knitting Department

Based on my observations and experience during my assignment, I recommend for consideration the following:

1. The immediate purchase of 16 additional cone stands and stop motions for both the SPJ 8M and RTR 8M so that 6 ends per feeder may be accommodated instead of the present 4. This would allow for 3 colour striping on 2 ends per feed and would greatly increase the pattern scope of the machines.

2. The immediate purchase of spare parts for each machine as per lists as per lists recommended in Chapters 9 and 10. These lists represent minumum stocks of parts which would be almost impossible to procure locally and could render a machine inoperable in the event of their breakage.

3. The purchase of various medium and small items of tools which should be installed or stored in the Knitting Department for the use of the technicians, such as:

   1 small bench vice
   1 small bench grinder (electric)
   Course and fine oil stores
   Needle pliers
   1 set screw extractors
   1 set 1/16 to 1/4 inch twist drills
     (or metric equivalent)
   1 set pin punches 1/16 to 1/4 inch.

   should be secured from Government funds.

4. The purchase of a yarn length meter (inches) with magnetic base (Jacquet, by Scott and Williams, USA recommended) which would be used on both the RTR and SPJ for the purpose of setting a precise stitch length recorded during sampling and also for accurate equalizing of the stitch length on all feeds.

12. Recommendations Regarding Yarns for the RTR 8M Machine (14 gg)

Because of the difficulties associated with running single ends of spun yarns on the RTR, I strongly recommend the following:

That all spun yarns to be used as a single end (i.e. one end per feeder) on the RTR machine be re-wound and cleared by the Winding Department. The Winding and Clearing should be of the highest standard so as to minimise press-offs and faults on the Knitting machine. The charge for such an operation should be included when costing the garment pieces.

ANNEX A

Procedure for Pattern Sampling on SPJ and RTR Machines

Pattern sampling on both these machines requires a systematic and detailed approach in order to avoid loss of time and possible machine damage due to malfunction caused by incorrect preparation of either the control film or pattern film.

The following procedure is recommended:

1. Decide what structure the pattern should be in e.g. plain and purl, plain and reverse knit, float or rib jacquard, transfer with tuck, etc.

2. Rule up graph paper to correct width allowing for "T" column on left hand side. Length is unimportant at this stage.

3. Number rows on graph according to machine type and fabric to be produced.

   It may be more convenient to number 2 knit rows on one line as in the case of 2 Col. jacquard so this must be taken into account.

4. Decide on pattern dimensions. This is easier if a piece of similar quality fabric is available so the number of courses and wales used for a particular figure may be used to provide actual dimensions to indicate its size.

5. Decide on approximate pattern repeat width (wales/pattern repeat) and if the pattern is to be symetrical make sure the width is a factor of 72.

6. Graph pattern, allocating symbols to represent different stitches or colours.

   Note the meaning of these symbols in the legend.

7. Make sure pattern repeat of length falls at the end of a section. If not, repeat pattern until it does.

Points to remember when graphing:

SPJ: transfer down cannot occur where bottom sliders are in the miss track.

Knit sections must be open in order for transfer sections to operate.

Knit sections select for knit or miss (tuck), transfer sections allow bottom or top knit.

Tucking or missing cannot be done unless bottom welt cams are out.

RTR: Transfer sections follow knit sections. Transfer graphs may need a symbol which indicates both knit and transfer. When graphing against standard numbering system 2 knit courses are produced for each graph line.

Mechatape Punching Plan

Once the graph has been drawn it is necessary to decide what must be punched in order to achieve the desired results at the mechatape unit. The punch plain should be clearly written on the graph and show what is to be punched at each knit and each transfer section.

Points to remeber:

SPJ: A hole in a knit section means either a miss (or tuck) stitch if the welt cam is withdrawn and also no transfer possibility.

A hole in a transfer section means no transfer (knit bottom). When no transfer is required a hole in the "T" row is sufficient to cancel selections.

RTR: A hole means cancelled selection, therefore, miss or no transfer depending on the section.

Transfer isolation can be affected by punching "T" row.

On both machines:

Number tape correctly according to machine type and always account for all sections, even when not in use.

Planning Cam Movements and Control Charts

Careful consideration must be given to the cam movements, striping, etc. necessary to produce the desired pattern. The necessary cam settings and striping changes should be clearly written on the graph and if striping is to be done, a striping plan should also be prepared. This may take the form of symbols on the side of the graph to indicate colour changes and should be continued on the central chart if a long series of stripes is needed.

Prepare a chart, numbering the feeds and movement with the appropriate numbers making sure the feed numbers begin with the penultimate feed.

Indicate on the chart the cam movements etc. required at the appropriate feeds.

Prepare the chart, having regard to all the movements desired. Check and re-check the chart for accuracy.

Points to Remember in Chart Preparation

On the SPJ, quality and striping changes must be punched one row after the desired feeder.

When a change in selection takes place it must be accompanied by a "trip" which must alternate left, right etc. and end on the right.

If no trip occurs, the selection previously in place will remain until tripped.

When a selection is no longer needed it should be tripped on the row after the last row requiring that selection.

In order to affect a change a selection must take place or remain from a previous selection.

Both striping and knit selections trip automatically to neutral and must be punched at every desired change.

- no punch - no change.

On the RTR, if transfer is desired, the sections must be opened and the "transfer selection" row punched to withdraw the transfer isolator lever which, under normal circumstances, is in the isolate position.

On the RTR, the stripers operate with No. 1 row being the cancel row, and figures 1,2,3 and 4 operating on rows 2,3,4 and 5 respectively.

At any time, if a yarn is striped out, it must be striped back when needles are reintroduced.

If the knit or transfer release does not operate the selection previously presented will remain in place.

Always write in the instruction column exactly what is required to be done and check that the numbers indicate all requirements which will be carried out.

ANNEX B

Determining the Optimum Loop Length on Circular Body-Length Machines

Loop length, i.e. the actual length of yarn in each loop is of primary importance when attempting to produce dimensionally stable knitted fabrics.

There is a mathematical relationship between the yarn count and the length of the loop for a given end-use. This is expressed in the following formula:

$$l = \frac{\sqrt{Tex}}{CF}$$

where l = loop length in cms.

Tex = resultant yarn count in gm/1000 m.

CF = cover factor

Cover factor is a number which represents the amount of yarn covering a given area.

12 to 13 is used for loose quality fabric

14 to 15 is used for medium quality fabric

16 to 17 is used for tight to very tight quality fabric

Example 1: Find the optimum loop length for 2 ends of

2/30s Nm

2 x 2/30m = 2 x 1/15 Nm

= 1/7.5 Nm (resultant count)

= 132 Tex

$$l = \frac{\sqrt{132}}{14} \text{ (medium quality)}$$

$$= \frac{11.5}{14}$$

= 0.82 cm

= 8.2 mm

Therefore, each loop should contain 8.2 mm of yarn

Example 2: Find the optimum loop length for 2 ends of 1/30s ECC

$$2 \times 1/30 \text{ ECC} = 1/15 \text{ ECC resultant count}$$

$$= 40 \text{ Tex}$$

$$= \frac{\sqrt{40}}{14} \quad \text{(Medium quality)}$$

$$= \frac{6.3}{14}$$

$$= 0.45 \text{ cm}$$

$$1 = 4.5 \text{ mm}$$

Therefore, each loop should contain 4.5 mm of yarn. Once the optimum loop length is known this can be converted to a course length i.e. the total length of yarn used in 1 complete revolution, as follows:

loop length (1) x total needles in machine = course length.

The course length can then be set on the machine by means of a yarn length meter (See recommendations) or by direct measurement.

It is important to note that for circular body-length machines considerations other than the optimum loop-length must be taken into account.

If, for example, a sample is produced at optimum loop length and its width is slightly greater or lesser than the most economical cutting width i.e. that width which results in the most efficient use of the fabric available, the loop length should be adjusted so as to bring the fabric width to that desired if possible.

Example: A pattern on optimum loop length provides a width of 68.5 cm (27 in) but the most economical width is 71 cm (28 in). Then the loop length must be increased to achieve the 71 cm (28 in).

Similarly, if a pattern produces a width greater than that required it is usually better to shorten the loop length to produce a narrower fabric than to cut the excess fabric to waste.

ANNEX C

Methods for Establishing Piece Running Times

In order to accurately cost garment pieces machine running times must be either measured or calculated.

This may be done in 3 ways depending on the circumstances:

1. If the machine is set up to make a sample the actual running time can be measured while the sample is being made.

2. If the machine has been set up previously but the time not recorded on accurate running time may be calculated from the recorded data obtained when the original sample was produced.

3. If a swatch or garment is offered for reproduction but an actual sample cannot be produced at the time the running per piece can be calculated on the basis of machine speed data and fabric details.

Machine Speed Data:

RTR	:	High Speed	:	3 sec/rev
		Low Speed	:	6 sec/rev
		Std. welt time	:	42 sec
SPJ	:	High Speed	:	3.3 sec/rev
		Low Speed	:	5 sec/rev
		Std. welt time	:	20 sec

Calculation of running times:

Note: For each method an efficiency factor must be applied to compensate for machine down time etc.

Method I

The running time obtained by measurement on a per piece basis may be converted to as per garment basis if needed by calculating the number of pieces required per garment.

e.g. a particular pattern gives a fabric width sufficient for 1 body per piece or 3 sleeves per piece. Since each garment requires 1 body and 2 sleeves then 5 pieces will produce 3 garments i.e. 3 body pieces and 2 sleeve pieces.

Note: This exercise may not be needed if the articles are to be sold on a per piece basis but is essential when costing for complete garments.

Method 2

From machine speed data and original sample data a time per piece may be calculated thus:

from sample data take total links and number of low speed links

then: sec/rev high speed Xno. of links (revs.) high speed.
plus: sec/rev low speed Xno. of links (revs.) low speed.

$$= \text{sec/piece} \times \frac{1}{60}$$

= min/piece

Method 3

Count courses per inch (CPI) (in band and body)

Examine fabric and determine number of courses/rev. in band and body
e.g. 1) on an 8 feed machine a jacquard fabric will produce 4 courses/rev.

2) on an RTR the band is knitted on 4 courses/rev.

Estimate number of slow speed revs required - standard for welts etc. but varying for stripes etc.

Then:

$$\frac{\text{CPI Body}}{\text{C/Rev}} = \text{revs/inch body}$$

$$\frac{\text{CPI band}}{\text{C/Rev}} = \text{revs/inch band}$$

revs/inch body x total inches in body = revs/body

revs/inch band x total/inches in band = revs/band

revs/body + revs/band = total revs/piece

estimate slow speed revs required and deduct from total revs to arrive at total high and low speed revs.
(Do not include slow speed revs. for welt).

Then sec/rev high speed x no. of high speed revs

Plus sec/rev low speed x no. of low speed revs

$$= \frac{\text{Sec/piece + standard welt time}}{60}$$

= min/piece

Note: The standard time for a welt should be added to the calculated time as it is not allowed for in the measurement of the piece length.

ANNEX D

List of Circular Knitters Visited

Oswal Woollen Mills
Hind Hosiery
Minerva Knitwear
Addicrafts Pvt. Ltd.
Swadeshi Karyala
Venus Fabrics
Deesons Knitwears
Tee-nit International
Rosy Knitwear

Other companies visited

Groz Beckart-Saboo
Metalfabric-Organ Needles
Amrit Mechanical

All the above visits were in the company of the Knitting Master and in some cases the C.T.A. or the Facility's staff.

Company : Oswal Woollen Mills (Export Zone),
Industrial Area-A
Ludhiana

Contact : Mr. B. Singh Mann

Visited : 16 February 1984

Assistance rendered : Discussion with Knitting Manager on general running of their circular machines. This company has installed some modern machines and seems to experience little difficulty making top class fabrics. Discussions were also centred around the types and suitability of various Komet hosiery machines.

Company : Hind Hosiery and Woollen Mills,
Focal Point, Ludhiana

Contact : Mr. (Gudu)

Visited : 22 February 1984
8 March 1984
15 March 1984

Assistance rendered : Advise on technical problems encountered on Circular terry machines. Machine elements and components badly worn. Discussions regarding suitability of various types of new circular machines. Instruction on fault tracing on multi-feed machines.

Company	:	Minerva Knitwear Civil Lines Ludhiana.
Contact	:	Mr. Chopra
Visited	:	29 February 1984
Assistance rendered	:	Mr. Chopra visited the Knitwear Facility on 28 February to discuss problems associated with the production of plain fabric for use in military vests. Standards were unable to be achieved as fabric was unstable. Subsequent examination of the Plant revealed that the whole of the processing of fabric from knitting through finishing to make-up was calculated to distort the fabric making it impossible to control shrinkage. Suggestions were made which would assist but further discussions were not held.
Name	:	Addicraft Pvt. Ltd. Industrial Area-B Ludhiana
Contact	:	Mr. Kidar Nath, Manager Mr. Sharma, Knitting Manager
Visited	:	7 March 1984 13 March 1984
Assistance rendered	:	Technical advise on positive feed problems. The Knitting Master visited the Facility a number of times requiring technical advise on fabric quality and yarn problems.
Name	:	Swadeshi Karyala Daresi Road Ludhiana
Contact	:	Mr. Virender Khosla
Visited	:	9 March 1984
Assistance rendered	:	This company was experiencing the same difficulties to those of Minerva, having similar processes, producing the same garment. Suggestions were offered but again, due to the machine types and the processes being used little could be done.

Name : Nagesh Knitwear Exports
Jullundur Road
Ludhiana

Contact : Mr. Ashok Mehra

Visited : 9 March 1984

Assistance rendered : Discussions were held about circular machine types and products but this company did not avail itself of the opportunity of technical assistance.

Name : Venus Fabrics
Industrial Area-A
Ludhiana

Contact : Mr. Neelam Jain

Visited : 23 March 1984
26 March 1984
4 April 1984
18 April 1984
14 May 1984

Assistance rendered : This company had recently purchased a new S/L striping machine which they were erecting. Advise and assistance was given in regard to stripers, stop motions, machine settings, fabrics and general machine maintenance.

Name : Deesons Knitwear
Bharat Nagar Chowk
Civil Lines
Ludhiana

Contact : Mr. Ajay Dewan

Visited :

Assistance rendered : Discussions with this company centred around the types of fabrics which the Facility's Circular machines could produce and how best these might be included in this company's range.

Name : Tee-knit International
Sarabha Nagar
Ludhiana

Contact : Mr. Rajan Puri

Visited : 31 March 1984

Assistance rendered : Discussions were held with this company which resulted in their expressing interest in adding garments knitted on the Facility's Circular machines to their range.

Name : Rosy Knitwear
Mall Road
Civil Lines
Ludhiana

Contact : Mr. Kalra

Assistance rendered : This manufacturer visited the Facility to discuss sample production and subsequently brought samples from which the Facility will produce a range.

Other Companies Visited

Groz Backert, Saboo
Chandigarh

Latch needle manufacturers

Metal Fabriks - Organ Needles
Miller Ganj
Ludhiana

Latch needle manufacturers

Amrit Mechanical
Industrial Area-B
Ludhiana

Flat knitting machines builders

This company was visited in response to a request for assistance on a technical problem on a particular machine.

The Knitting Master, the C.T.A. and myself were able to offer suggestions for the solution of their problem.

CONCLUSION

In my opinion the Knitting Department of the Knitwear Facility is staffed by technically competent, capable people.

The Knitting Master, the knitters and make-up staff have, during my tour of duty, proved they can produce stitches, patterns and garments of a very high standard. They have also shown that they are a valuable source of technical assistance for the knitting industry as a whole and it would appear that more and more companies are seeking their advise and their expertise.

I believe that, in the interest of sound management, the staff should be given the opportunity to study other machine types in the department so that they become at least competent operators, if not technicians, on all machines. This broad-base training would ensure a more versatile staff who could temporarily replace another member should the need arise.