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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

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DEVELOPMENT OF HOSIERY AND KNITWEAR INDUSTRY

LUDHIANA (PUNJAB), PHASE II

DP/IND/82/006

INDIA

Technical Report: Technical Assistance in Worsted Spinning and Quality Control*

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 G.A. Heeley
Expert in Worsted Spinning and Quality Control

United Nations Industrial Development Organization

Vienna

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I. BRIEFING

1.0 The Expert started this mission in Vienna with briefing at UNIDO, HQ, on 25/26th April, 1985.

1.1 The JD as prescribed by UNIDC for this post is as follows:-

- assist in setting up a spinning unit at the Facility, including a work programme the covers both product development and technical assistance work;
- train the Facility's staff in worsted spinning and process control;
- establish norms of operational parameters such as waste levels;
- advise on quality control methods, related tests, and on the interpretation of results;
- advise on the selection of raw materials.

1.2 During the briefing, Mr. Minke invited particular attention to the following aspects:-

1.2.1 The urgency to complete installation of the spinning machines and commissioning them which had been delayed due to political unrest, for almost a year. Mr. Minke informed that erectors of the machinery suppliers e.g. Zinsertex and Schlumberger NSC were at the project and the work of machinery erection was already nearing completion.

1.2.2 After appraisal of machinery list, a discussion then took place on the desirability of increasing the number of bobbins for the FM6 Finisher. It was agreed to order a further 4000 nos.

1.2.3 That a yarn of <u>full</u> international standard was the objective so that the objective of the project in assisting to create export markets in hard currency area (HCA) market could be achieved.

1.2.4 The knitwear Facility (KF) should demonstrate possibilities to manufacture a range of counts and qualities on the modern machines.

1.2.5 A preliminary report was requested within 15 days.

1.3 The Expert arrived in New Delhi on 29 April;

1.3.1 Dr. M. K. Hussein, SIDFA, informed him that 3 fitters were on station. These fitters for one or the other reason were proving to be difficult. A request by the project authorities that the FMS Finisher be relocated and a further request that the overhead cleaners for ring spinning frames be installed by them, brought a storm of complaint and demands for more money etc. The SIDFA had already dealt with this matter but will the expert watch on station?

1.3.2 SIDFA emphasised need to involve completely to ensure successful outcome of the mission.

1.4 The Expert travelled to Ludhiana on 30th April, 1985. On arrival at the Project he had extended discussion with NPD.

1.4.1 The Expert was reminded that spinning inputs in the projects were expected to produce a multiplier effect; to generally raise technology and quality standards in the local spinning industry, and consequently upgrade the end product.

1.4.2 There could be no pretending that the culture acquired by the industry as a cumulative effect of local attitudes, trade conditions, government policies and other factors, can be changed overnight. But the project will have to demonstrate or show, that new technologies made 'economic sense'. Besides how by adopting more scientific methods and trade practices, such as conditioned weight basis for raw materials and yarns, and standard oil content, in preference to the present trade practice, would end many troubles.

1.4.3 The commissioning of the equipment was nearly complete and therefore, the immediate task of the Expert will be to train staff at all level down to operatives, helpers and trolley pushers so that modern practices are adopted <u>at once</u>, so that the aim of producing high quality yarn under <u>mill conditions</u> could be realised. The staff would have to be drilled in standards from start to finish, including prevention of mixes, maintenance, effeciency norms, work loads etc. The idea being to generate sufficient momentum to sustain the practices introduced by the Expert after his departure.

1.4.4 The Expert was requested to prepare a task list to cover requirements of the JD and also to achieve 'out-put' of the Spinning Section stated in the prodoc.

II. REVIEW

2.1 In view of the SIDFA's remarks during briefing, the Expert talked to the 3 erectors on site and provided them opportunity to air their grievances. It soon became apparent that no basis existed or there was no genuine grievances. Like many erectors at an alien station they had been abrasive unnecessarily. Work was prcceeding and therefore, the Expert considered it wise to distance himself from their complaints.

2.2 The Expert then proceeded to carry out a review of the ground conditions including status of machinery and services. Following are the findings:

2.2.1 A preliminary survey showed the NSC machinery to be satisfactorily commissed.

2.2.2 Erection of all 7 Zinzer 319L ring spinners were virtually complete. The erectors were working on final settings and completing check lists. The actual commissioning suffered certain delays, but nevertheless this was achieved with the signing of the Zinzer erectors protocol on 22nd May, 1985.

2.2.3 Calculation of capacities of post spinning machines (winders and twisters) showed an imbalance between capacity in the spinning and post-spinning sections. As a result full running of the spinning frames will not be possible until such time as the imbalance can be corrected, but for the time being this fact should not interfere with the declared aims of the Project.

2.2.4 With atmospheric humidity far below that required to successfully process wool, and humidification and air conditioning plants yet to be commissioned, commissioning of spinning machines will be done with acrylic only.

2.2.5 Services in general were found to be long winded but eventually provided. In particular electrical services, where tendency was to provide temporary connections. This was deemed both costly and dangerous. Inefficient air conditioning in the laboratory area, rendered many test results open to doubt and therefore, useless.

2.2.6 Compressed air supply was not adequate at all times. (Although action was subsequently taken, it is possible that difficulties might arise in the long run).

2.2.7 During the enforced quiet period of almost one year prior to commencement of erection birds had taken up residence in the shed housing preperatory machines. (However, later increasing activity in the area solved this problem).

2.2.8 The facilities for storage of raw materials were very inadequate. The project authorities were seized of the matter already and a permanent store for tops were planned.

2.2.9 Storage facilities for rovings and yarn were either non-existant or inadequate. It will have to be priority to get the materials handling message across.

2.2.10 Floors in spinning and preparation areas needed to be sealed.

2.2.11 There was excessive solar radiation as window panes were of clear glass.

2.2.12 Time keeping by the department staff and workers was noted as apalling.

II.A BRIEF REVIEW OF LOCAL CONDITIONS

2A.1 It was considered essential that time be made available to investigate the availability of raw materials, their quality, as well as a brief look at labour - maintenance - quality etc. in local mills.

2A.1.1 Supplies of locally produced wool tops although adequate from a quantative point of view, left much to be desired on quality.

In general, the tops are;
- short on fibre length
- high in vegetable matter
- high in oil content
- not well scoured and combed.

2A.1.2 Machinery employed by local spinners is generally old, certainly not capable of producing a high quality product and badly maintained. One exception is a recently installed plant. But in the Expert's view not

attaining to the technology available to KF. Here again lack of adequate maintenance was apparent. Yarns in general are inadequate to meet requirement of HCA markets.

2A.1.3 Labour norms are exceptionally high. In ring spinning, one operator for 100 spindles. It was stated that high labour norms were adopted due to;

a) the quality of raw material
b) the condition of machinery.

2A.1.4 Physical waste is exceptionally high, up to 10%.

2A.1.5 Locally produced additives are used extensively to provide the spinnability lacking in the raw material and also to increase scale weight of the finished product.

2A.2 The survey brought home that by supplying high quality yarns at commercially acceptable prices, KF can create a need for such yarns so that eventually local Spinners may be forced to raise their standards through equipment renewal.

2A.3 To do so successfully, KF must demonstrate its pilot plant as a productive unit meeting norms of quality efficiency, productivity on a sound cost effective basis.

III. TASKS

3.1 Following the surveys (Section II) the various tasks to be carried out during the mission were listed below.

3.1.1 Running in of machinery and initial operator training and system.

3.1.2 Training of staff by means of lectures and practical demonstration.

3.1.3 Study consumables spare and additives.

3.1.4 Fixing work loads from drawing through post spinning, including staff and maintenance, levels according to experience values in Developing countries.

3.1.5 Prescribe procedural systems, job or blend cards. Provide production and productivity norms with reporting methods.

3.1.6 Establish control systems for quality, waste maintenance and stocks etc,

3.1.7 Process parameters and settings for different counts, materials and blends (for hosiery and weaving yarns).

3.1.8 Guidelines on the selection of raw materials related to yarns and blends required to be manufactured.

3.1.9 Review present system of covering for moisture loss and suggest a workable system.

3.1.10 Provide continuing training and prepare operators manual.

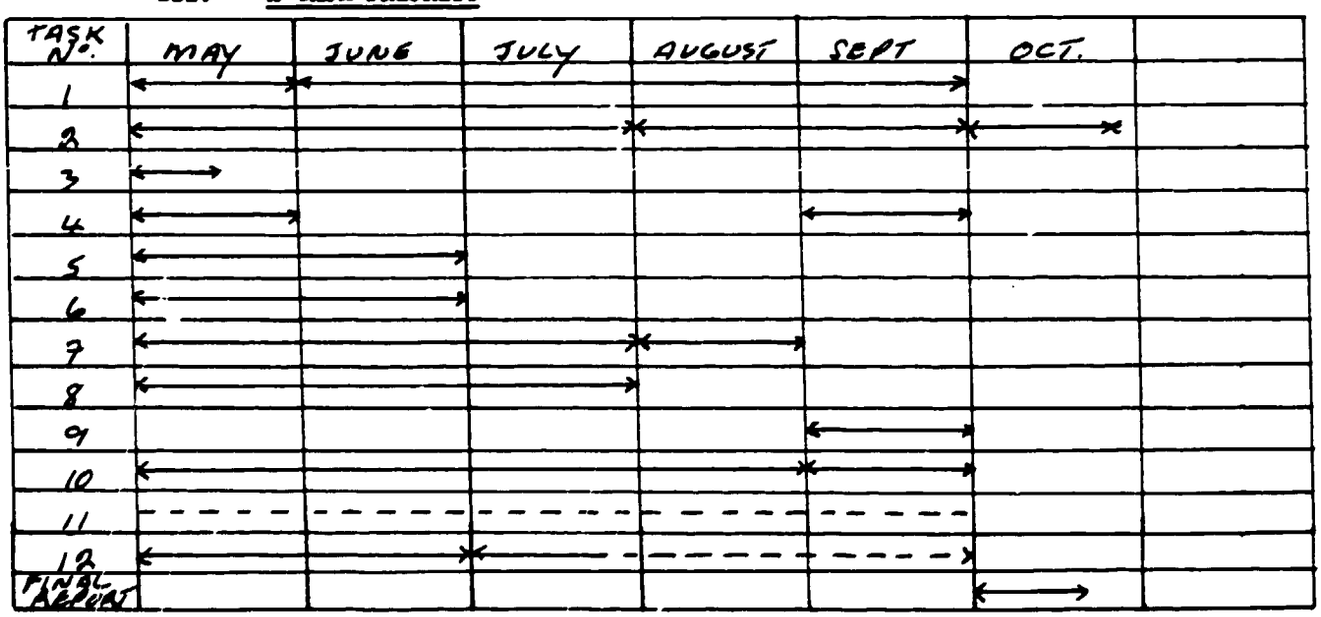
3.1.11 To provide a basis for continuing product development.

3.1.12 Identify elements of a technical assistance programme and prepare an ongoing programme for technical assistance to be provided to the industry.

3.1.13 Train counterpart in technical assistance work.

3.2 At this stage it was premature for the Expert to visualize if he would be able to complete all tasks listed. The task list is in order of priority, tasks involved in preparing to run the plant at anticipated levels of efficiency, productivity and quality, would be completed even if it meant extended hours working for the Expert and project staff. It was considered unwise to attempt all things if it became apparent that it will not be physically possible to do them justice, purely for the sake of form.

III. A TASK PRIORITY



IV. WORK METHODOLOGY

4.1 After consulting with the Project Staff, the Expert came to the conclusion that the tasks listed on page 6 will be accomplished best through the procedure of Hands on Training, Shop Floor Demonstration, Lectures, Notes and Instruction Sheets, and above all by his own example. The idea being that the staff and labour adopt a culture in line with the need to establish all round high standards of performance, and the corresponding needs of Orderliness, Cleanliness, Minimal Waste and avoidance of Mixes and Contamination of different counts and Materials under all circumstances.

To this end lectures were delivered to staff on the following topics in simple language.,

The importance of

- Orderliness and Cleanliness
- Time in an Industrial Society and m/c utilisation
- Waste control
- Material or lot separation

The Lecture notes issued to the staff are shown as —— Appendix I (1A to 1D).

4.2 The report has been written in a form so that it is handy as instruction book for future use by the staff and management. The text book form is avoided to give it practical orientation and which hopefully is easily understood by the technicians.

4.3 Running-in was initiated by drawing up a job or Blend Card on which the Process Parameters required for the material to be processed are shown together with norms of quality which had to be met, i.e. U% Standards etc. The blend was then processed with staff and operators taking part under instruction. Settings and adjustments required to obtain the required standards were made and demonstrated as were the correct methods of creeling, piecing and doffing etc.

The Blend was followed through preparation to Spinning and Post Spinning. The Blend Card always being in evidence and actual results of Quality Norms and waste etc recorded.

The process was repeated with every blend. To date 50 in all, representing some 45,000 Kg. The job or blend card is shown as
—— Appendix II.

4.4 The training of staff to continue throughout the mission, by means of continuing hands on demonstration and practice. Lectures on following topics which are directed at the supervisor level were delivered:-

- Material Handling
- Elementary Raw Materials
- Introduction to Yarn Mamufacture

—— Appendix III (IIIA to IIID).

4.5 Consumables and spares were seen as a priority. Involving the staff, erectors and manuals, together with personal experience of likely requirements, a study of spares was made and submitted. Another study was made of the consumables and additives. The locally available requirements were also identified in each case. The results of the studies are shown as
—— Appendix IV.

4.6 A study of work loads and labour component was made with staff involvement. It was pointed out to the staff that norms of labour in Developing Countries would be applied. This quickly brought protest and opposition from local culture.

A suggestion that one worker should operate 2 Gill Boxes brought outcry. Whilst the suggestion that one worker attend to 496 Ring Spindles brought tears. It was nevertheless agreed that a labour chart reflecting labour norms in developing Countries be drawn up, and although not immediately attainable, we should work to that end.

—— Appendix V.

4.7 With the Blend or Job Card already installed, running in going on space, it is now necessary to establish production norms and the method of reporting. This was done by:-

a) Designing a method of Reporting and Calculation.
b) A lecture to staff with lecture notes issued.

—— Appendix VI (A + B).

Production norms are included. Spinning Master (P) to be responsible for presentation of the required data daily. Spinning Master (T) for calculation.

4.8 CONTROLS: A lecture on a simple Quality Control System was delivered and issued. The intent is for the notes to form the basis for routine Quality Control necessary. Spinning Master (T) to apply the routine.

—— Shown as Appendix VII. Waste control is shown as a lecture which is shown in Appendix I. Actual waste results are currently at 5.1% level. These results should improve.

4.9 A Maintenance Manual has been prepared. With the use of this manual all maintenance should be routine. The Manual combines Makers recommendations with personal experience. A design for a simple spares stock card is also shown with the Manual.

It is essential that at all times Maintenance activities be accurately recorded in the Maintenance Book with dates.

The Assistant Spinning Master to be responsible for all maintenance records and stocks, which will be inspected by Spinning Master (P) periodically.

—— Appendix VIII.

4.10 Experience with available raw materials, along with past experience has been utilised to provide process parameters and settings, as shown in the manual for "High Tec Yarns". These words are derived from "High Technology" and which hopefully will be a hallmark of KF Yarns. The manual has been distributed to staff and is shown as
—— Appendix IX.

4.11 The selection of raw materials is a most important function. The Expert has made recommendations on the basis of

a) Raw materials ideally required (experience data)
b) from locally available sources, for the time being
c) summary of actual results obtained is shown at

—— Appendix X.

4.12 Invoicing of Yarns on a scale weight basis is far from a sound procedure. It is potentially a very costly one also, both financially and in time spent discussing complaints of scale weight. No doubt, KF have the opportunity here to set an example by initiating correct procedures, which are detailed at

—— Appendix XI.

4.13 Preparation of Operators Manual was assembled process by process during the training period. The project officials have been requested for its translation into local language(s). When complete the translations could be issued to the appropriate operators. Practical application of this is in the hands of the Training Officer, Spinning Master (P) and the Supervisors.

—— Appendix XII.

4.14 Technical Assistance, a must in KF function, has only been possible in a very limited way. There was no time to formulate a programme or to train staff. Some assistance was given however, to 4 units, who accepted the principle that the Expert could only be available after the end of the working day.

--- Appendix XIII (A + D).

V. ACCOMPLISHMENTS

5.1 In accomplishing tasks, the Expert had in mind his experience in other Developing Countries, that everything cannot be Black and White. Little can be achieved by drawing up a set of rules, stating I want this and that. For example, had the Expert stuck to his labour norm of 496 spindles, or insisted on being supplied with raw materials to match his specification, he would have achieved little. At all times the Expert has been prepared to adapt, occasionally compromise, or be prepared to fail. Solutions must be and were found to meet local situation(s).

5.2 The Appendices referred to in Work Methodology (Section V) are in the main original notes and documents, issued to staff during the mission. This has been done not only to illustrate the effort of the mission, but to save time in the drafting of this report.

The report as a whole and the Appendices in particular, have been designed to become a practical work of reference for KF staff so that the impetus generated during the Mission may continue, in the efficient demonstration of producing high quality yarns.

5.3 Be-deviled by interuption to the Power Supply, various construction work still in progress, the difficulties of obtaining raw materials, and above all, the need to inculcate correct procedures from the word go, initial start to the production was slow.

5.4 Since a determined start to continuous production on 6th July 1985, progress has been satisfactory. From a machine efficiency of 30% in July to 85.7% on 5th October 1985, based on 8 hrs running of ring spinning which is well above the conservative target of 70% agreed by the staff and Expert.

5.5 The maintenance of high efficiency will now largely depend on sound planning and stocks. It is essential that stocks of raw material be maintained of at least 2 weeks supply or approximately 15,000 Kilo's. This provides for the running of the plant to its most efficient norm.

5.6 Guidelines for establishing production planning, together with a suggested production plan, are shown as

—— Appendix XIV.

- Minimum Lot size should be 1,000 Kilos per Ring Frame

- Production blocks will also occur from time to time due to:-

a) Machine breakdowns in critical areas i.e. FM6 Finishe or Autoconer etc.
b) Unsuitable raw material. A problem already encountered with excessive fatty content in wool tops due to incorrect treatment or additives with the Fliesner Shrink-proofing process.

5.7 With the exception of one Blend of 2/48' Nm and one of 1/42 Nm, which was due to overspinning of the raw material then available, the Expert feels that quality parameters on wool yarn have been well met. A comparison of KF results, compared with 3 local units is given in the Table below:

Unit	Microns	AV length	Nominal count	Actual count	U%	Thick places	Thin places	Neps	Rating
Uster 25% Exp. Values			1/31	1/31	13'4	51	93	13	STD
KF	22'75	57'5	1/31	1/31'22	13'51	54	112	37	2
KF	22'7	61'0	1/31	1/31'25	13'23	41	82	8	1
KF	22'6	57'5	1/31	1/31'10	13'56	58	97	19	2
KF	22'5	55'0	1/31	1/31'40	13'71	68	114	59	3
Unit 1	22'5	55/57	1/31	1/30'75	14'07	70	164	108	4
Unit 2	22'5	55/57	1/31	1/30'25	13'97	122	235	148	6
Unit 3	22'5	55/57	1/31	1/29'5	15'25	64	130	83	5

- The table puts KF ahead on U%, thick places, thin places and neps. No doubt the thick and thin place standards are the biggest factor contributing to the improved visual appearance of KF Yarns compared to other Units.

- Hairiness KF YARN (32 Nm) was found to have 59,000 hairs per 1,000 mts. compared to top local unit's 123,000.

- It has been the Experts experience when running in with green labour that unless all m/c settings are at optimum, excessive tearing off of bottom drafting aprons occurs. This is not the experience at KF, which to date has only required 5 aprons to be replaced from the total of 3472, a further substantial indication of the quality of KF Yarns, and the quality of training.

5.8 VARIOUS RECOMMENDATIONS WITH STATUS

It is recommended that KF does not process acrylic yarns except from Converted Top.

- A balling head fitted to the defelter in place of the can delivery, would be much more practical, considering that the next passage (blending), is fitted with a ball creel and not a can creel. De-Felted slivers are too uneven to deliver back to customers and both passages are required.

- The compressed air supply in post spinning is still insufficient and should be taken care of before troubles start.

- The Expert pointed out the dangers of fibre contamination when processing wool and acrylic in the same area. The subject was discussed with the project authorities. The 7 Ring Frames, have already been split into 3 plus 4 by means of a suitable floor to ceiling screen. The work has been completed in excellent manner.

- The Expert has made recommendations on materials handling which have been accepted in principle, but the on going work is slow and should be expedited. Great importance is attached to this one for avoi'ance of mixes which can be dangerous and costly.

- STAFFING: The Expert recommended that 2 spinning masters be employed, if the Unit was to fulfil all its aims and objects. As both production and technical inputs are required, KF requirements are far from orthodox. KF has to meet

  a) the technical function required within the project and
  b) the technical requirements of outside units on request.

  To fulfil this function a person strong in technical background in possession of the requisite Degree and having been exposed in practice to methods of scientific analysis is a necessity.

Secondly to ensure the smooth running of the plant a person is required, who

a) is strong on shop floor management, with a Hands on approach, which has been gained by extensive experience of practical mill work and
b) experienced to deal with day by day labour problems, machinery and maintenance, production schedules etc.

This suggestion was adopted in the form of:

Spinning Master (Technical)
Spinning Master (Production)

Both of whom are installed.

- Operator work loads were relaxed in order to MOVE the unit. The Expert suggests the time has now come when steps should be taken to bring the work force to the levels suggested in the labour chart at Appendix II.

  Some progress has already been made, which should be ongoing.

- The Expert recommended that in order to control waste, it was necessary to establish a system which rendered checking of each machine shift by shift feasible. The basic recommendation required 3 waste cans per machine. Each can of a different colour to differentiate between 3 shifts. This done, simple weighing and recording is all that remains necessary to be carried out by supervisors. Empty 50 Kilo drums, suitably cleaned and painted are suitable for this purpose. Progress is slow.

- The Expert strongly recommended that effort be made to obtain a person skilled in Hands on Schlafhorst Autoconer maintenance. In addition advantage be also taken of training courses on Autoconer, held in India from time to time.

- It is desirable that all preparation or drawing cans be fitted with spring loaded platforms. This avoids sliver entanglement, consequent sliver breaks, giving increased piecings and waste. Suitable castors fitted to sliver cans, will avoid accidents and reduce effort required for their movement. Can life will be prolonged substantially status, items on order, delivery awaited.

- It is recommended that KF should purchase a Zinzer Electronic Card Simulator. This would facilitate card repairs on site, and saving a great deal of production time and money.

- The NPD requested a bonus scheme to be suggested. This is shown as
— Appendix XV.

VI. REVIEW OF TASK LIST

6.1 Tasks from 3.1.1 to 3.1.10 (Section III) were fully completed. KF now has a fully operational Spinning Plant, together with labour and staff, fully trained in all aspects including operations, supervision, planning, controls, maintenance, productivity norms quality controls etc. Organisation and systems recommended by the Expert and necessary for efficient production of high standard quality yarns are in full use. Quality level of 25% world's mills production (Uster Standard) has been achieved in spite of constraint of materials etc. Excellent results have been attained in waste controls and machinery maintenance standards to-date.

6.2 To-date there is no demand existing for self twist yarns produced on Repco machines. It was therefore, decided with the project authorities that during the mission the Expert would not expend valuable time on this aspect. The project authorities will however, take steps to introduce the technology/yarns.

6.3 It was not possible to do any work on fancy yarns as the Saurer Allma machine has not been commissioned to-date.

6.4 It was not possible to demonstrate the correct methods of re-grinding roller cots to maintenance staff and mechanics, as the originally supplied cot grinding machine was damaged in transit and even though, it was learnt, that insurance formalities were completed many months ago, a replacement was yet to be delivered.

6.5 Little or no time could be found for product development and technical assistance functions. As a matter of fact it was little too early also to start on a programme of development which involves setting and resetting of the machines. Before proceeding to this work it is necessary to run-in the machines, establish of few standard blends, corresponding routines and create an environment to attain the quality standards. This pre-condition is necessary to avoid mistakes and troubles. Moreover there has also been constraint of supplies of raw-material of required specifications and other pressures on time.

6.6 THE PILOT PLANT

It will be evident from the foregoing that emphasis has been placed on running the pilot plant up to international norms, so that it can service its purpose as a Model. This must continue to be the objective which means that pilot production should continue on sound technical and economic footings.

VII. REVIEW OF OUTPUTS

A comparison of outputs envisaged and those actually realised is given below:

1.1 A completely installed spinning plant for the manufacture of worsted spun yarn (in particular wool and acrylic) complete with prepreatory equipment and installation for shrink resist treatment of wool tops in accordance with the processing technology required for the IWS superwash standard.	Spinning Plant installed, commissioned and run in. Working on sound basis.
1.2 The spinning plant and its technical staff will be capable of:	
a) Demonstration of modern processing technology to the local spinning industry under continuous mill working conditions and management.	DONE. Staff working with growing ability and confidence.
b) Of providing the knitting industry with a wide range of yarn types and counts (Wool Nm 12-60) (Acrylics 20-48) complying with standards within internationally accepted Uster values necessary for producing a variety of Knitwear at quality levels acceptable to targets markets in Hard Currency Markets.	Although makers claim is Nm 12^{s} to 60^{s} for 100% wool. The Expert does not see this range as practicable. Counts in the coarser range are inefficient. In the higher range above Nm 48^{s}. It is not foreseen that a suitable top will be available. The plant has been successfully demonstrated from Nm 16^{s} to 48^{s}.
c) Providing consultancy service to the industry through 4 (four) trained local technicians 1 (one) in blending and roving, 1 (one) in preventive maintenance of spinning frames.	The Spinning Master (P) and Assistant Spinning Master are quite capable of demonstrating blending and roving plus spinning technology and preventive maintenance.
d) Conducting seminars for the staff of local industry on the experiences gained in the spinning plant.	The conducting of seminars requires more time and experience, than has been acquired by staff as yet.

1.3	The technology used in the spinning plant will be explained in manuals prepared by international experts in coordination with IWS and suppliers of equipment for a) shrink resist treatment for wool tops and b) spinning technology for wool and acrylics.	DONE
2.1	Yarn preparation unit for twisting, cone winding, dye cheese winding, yarn clearing, fancy yarn twisting capable of providing for the spinning, knitting and dyeing industry.	DONE, with exception of fancy twister. Not yet erected.
2.2	2 (two) trained technicians in the afore-mentioned techniques with acquired practical experience of consultancy services gained during the lifetime of the project in at least 10 (ten) local manufacturing units and in processing of 1,000 kg of yarn on each of the different types of machinery installed in the centre.	DONE. SPINNING MASTER (T)

VIII. RECOMMENDATIONS FOR FUTURE

8.1 The Expert has no doubts that the impetus gained during the mission can and must be maintained. For this the rules will have to be followed. A period of consolidation is recommended, so that a solid foundation is laid for future progress and development.

8.2 Experimentation can be a dangerous pastime. It should not be indulged in without very careful consideration. Time alone will bring the skill etc necessary to succeed.

8.3 Sound pipelines for supply of raw materials of required specification must be established as quickly as possible. Do not be content with doing better than local units. The target must be towards excellence which cannot be attained with wool tops produced from the present wools with additives.

8.4 A rationalisation of the product range is strongly advised.

It should be borne in mind that your machines are designed to process better grade materials and attain excellent quality yarns. Such mixes as give high machine efficiency, target quality at least cost should therefore, be produced.

8.5 Nowhere is the local culture more in evidence than in yarn packaging. To fulfil its goal of leading away from the local culture and raising technology and quality standards, KF must move away from the present system of yarn deliveries sewn up in Jute bagging. This is dangerous for yarn, unsightly and creates an impression of non-caring. Packing should be done in cartons containing 40 Kilo's per carton. Printed KF high Tech. Yarns.

8.6 The spinning machines have electronic controls which have given troubles. The project does not have a qualified/ trained person to attend to electric and control circuit faults on these machines. The need for a good electronic engineer is therefore, apparent. The Expert suggests the appointment as being urgent.

8.7 Auto-doffer on the Autoconer should be run so that efficiency increase of 10% is obtained in this critical area. The standard of quality should be maintained after the departure of the Expert. Provided the prescribed parameters and processing standards are ADHERED TO, there should be no troubles.

8.8 Processing of acrylic tops supplied by IPCL or J. K. Synthetics have presented no difficulties and produced satisfactory performance. Yarns produced from locally carded fibre were not fully satisfactory. Nep count was excessive caused by inefficient carding. Therefore, the local carding should be avoided.

8.9 False tints for wool will be received. These are designed to prevent mixes of different counts and qualities. Four colours have been ordered from which a wide range can be produced by mixing in varying proportion. Do not use colours indiscriminately, but designate the colours over your product range. Keep to the colour plan at all times.

e.g.	2/48	100% Wool	Pink
	1/42	100% Wool	Turquoise
	2/30	100% Wool	Green
	2/26	100% Wool	Blue

XIV. ACKNOWLEDGEMENTS

In particular the Managing Director/NPD for his immense contribution in interest, time and advice.

To the TCCWM for his on the spot involvement at all times, totalling many hours of extra effort.

For the total effort of the Spinning Master (P) and Assistant Spinning Master.

And to the staff in general. All of which have contributed to the success of the Mission.

APPENDIX I

THE IMPORTANCE OF ORDERLINESS & CLEANLINESS

Equally as important as technical matters i.e. U% - Fibre Length - Drafts - Doublings etc, is the question of orderliness and cleanliness.

1. a) More problems - complaints - difficulties are caused by disorder than are caused by faulty processing i.e. wrong blends - mixed roving yarn - wrong draft wheels and twist wheels.

   Everything must have a place and be kept in it.

   b) You must have a properly ordered top store into which tops are carefully checked in and out with each quality and or lot/merge etc stored separately and carefully.

   c) Tops must only be removed from the Store to the Preparation or Drawing Area as and when required. You must not use the Drawing Area as a Secondary Top Store.

   d) All machines should have a blackboard on which the Lot or Blend number, quality - draft - twist etc are prominently displayed.

   e) Colours of various Bobbins - Tubes - Cones should be fully utilized, to a degree where colour is a means of control. When processing large blends, you may have to allow a change of Bobbin or Tube Colour. This should only be done by someone in authority - even then the colours should be treated as a separate item and not mixed.

   f) All storage tubs - bins - trolleys must carry a board or ticket giving details of contents.

   g) A potential source of mixing is "Material to be tested".

   All Tops - Bobbins - Cones or whatever Must carry a correctly written ticket at all times until returned to its/their source of origin.

   h) Storage areas must be designated in the factory i.e. a space for cans between the various drawing operations.

   Areas for Roving/Trolleys - Yarn Tubs - Trolleys etc also must be clearly defined.

   It may be good to use white road paint on the floor spelling out each area.

   i) Such items as gear wheels - tools and spares must each have its own appointed place.

2. CLEANLINESS

   a) Cleanliness is next to Godliness: The factory area - if contamination - staining - dirt etc, are to be avoided, must be spotless at all times, Hospital clean. This is especially so when different fibres are processed, acrylic being of light specific gravity will float on any air current in the vicinity.

b) Machine cleanliness is also of paramount importance. Make sure prior to starting a Blend that all foreign bodies are removed i.e. Fibre - Dirt - Oil etc.

c) Do not use Tops or Bundles or yarn as Buffets. This not only leaves dirt and stains, but is a contributing factor in waste.

d) Do not leave lying any Bobbin Tube or Cone whether full or empty. That may be on the floor or deposited or dropped elsewhere. Check carefully and return to its rightful place.

e) For the sake or both cleanliness and orderliness - do not overfill any container. This is not only untidy but dangerous. Fallen Bobbins/Tubes not only become dirty, but may be picked up by the uninitiated and deposited in an incorrect place.

In any factory the list is endless. You must be constantly vigilant.

APPENDIX 1B

Time in an Industrial Society and M/C Utilisation

1. The machine is the master in an industrial society.

2. Importance of starting and finishing times, break times etc.

   Starting and stopping should not be according to individual whim, but strictly controlled and signalled by a responsible person - perhaps by means of a hooter.

3. Lost production 5 minutes per shift of 8 hrs means one machine stopped for 7½ hrs - nearly one shift.

4. All responsible persons should see to it that their own timekeeping is impeccable. In order to set an example, indeed they must be prepared to extend their normal working hours at the beginning and ending of a shift. This is to ensure smooth change over.

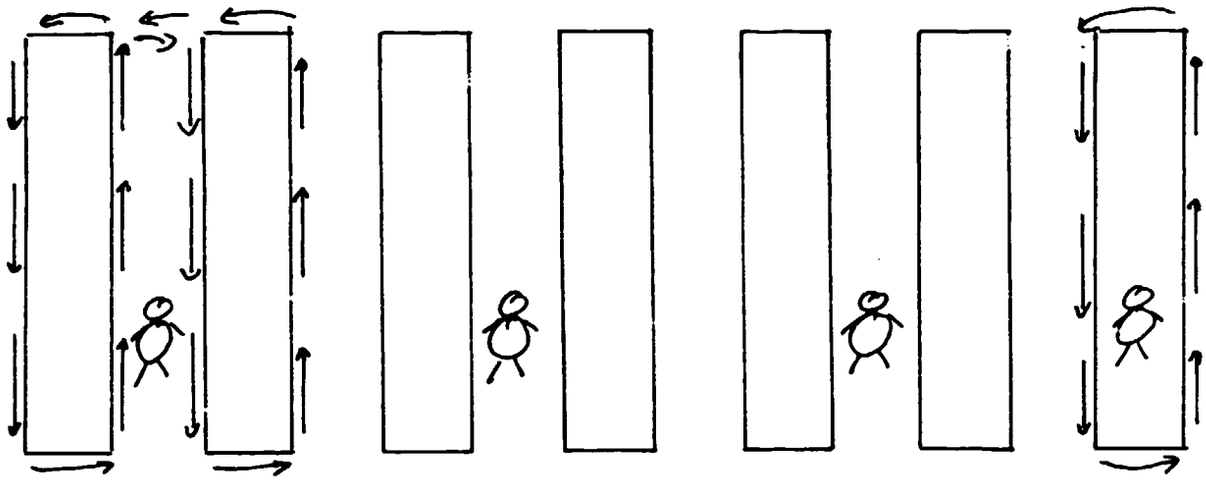
1) COMING TO M/C UTILISATION the practice of shutting down for say 30 minutes each shift is too common. Your productivity will (or should be) be based on machine availability for 24 hrs. It is, therefore, of the utmost importance that you organise split breaks. For example, in preparation you may find it necessary to run the F.M.6 Finisher 24 hrs daily. You are staffed with 2 workers for Gill Boxes
   1 worker for FM6 Finisher
   3 Total workers

   :- 2 should take their break say 10 am to 10.30 am retaining the FM6 Finisher Operator who takes his break 10.30 am to 11.00 am. You now have one operator worker for the Gill Boxes plus one for the FM6 Finisher. At 11.00 am you return to normal. Repeat at appropriate times for further shifts.

Spinning is more difficult and should be arranged as follows:-

You have 7 spinners + 1 supervisor. At the first break 3 spinners and 1 supervisor leave, 4 spinners for 7 machines.
At the second break 4 spinners break leaving 3 spinners and 1 supervisor for 7 machines.
Return to normal at the end of second break. Repeat for subsequent shifts. Whilst not strictly necessary at this point in time to split break in spinning - because of over capacity to twisting and winding. There is much to be said for establishing a system from the word Go - often avoiding labour problems at a later date.

Below a diagram shows the patrolling method to be used.



Repeat for all m/cs.

a) The above sketch shows the method to adopt during meal or break times.

   3 spinners x 2 m/cs and 1 spinning x 1 m/c. The later being the weakest from spinner point of view.

b) Patrolling must be continuous - no backtracking. Roving should be pulled out to prevent waste when end breaks occur. Leaving the repair of the broken end to later.

c) The number of ends the spinner under double lead will repair, depends on his/her own efficiency and effort. The spinability of the roving being spun and the degree of supervision.

d) The same method should be adopted for Schlafhorst Autoconer & Volkman Hamel twisting.

   Do not attempt this system on hand winding.

APPENDIX 1C

WASTE CONTROL

Raw material is expensive and must be carefully conserved as must other consumables.

Excessive waste is usually a sign of :-

a) Poor quality raw material (unsuitable for the job in hand)

b) Badly set or poorly maintained machinery

c) Inefficient and poor workmanship

d) Bad housekeeping

e) Spinning outside reasonable count range

1) It is comparatively easy (or should be) to obtain the total loss figure i.e. the difference between input weight and output weight. All that is required are accurate weighing at all stages.

2) On the present system of top invoicing at 18¼% Regain - without any comparable advantage to the spinner, you will have to take steps to condition your yarn prior to invoicing. Thus trying to recover some of your invisible loss.

3) Check your raw material carefully on receipt. Badly packed raw material i.e. burst packing etc, can result in wastages even before you begin.

4) Unpacking of raw material is of the utmost importance. Careless unpacking and bad handling results in both waste and yarn faults. Unpacking should be done under supervision. Tops should be removed and stacked neatly on duckboards adjacent to the first passage or operation. Do not drag Tops.

5) In general it is possible to feed certain items, which would otherwise go to waste, into the back of the Autoleveller. There are however certain qualifications. Any item so re-fed must be carefully handled - making sure a limited quantity is fed at any one time, so as not to overload the Autoleveller Mechanism.

   It is desirable to feed the item to the Autoleveller, in such a way, that two consecutive draftings are not in the same direction. By example the following can safely be fed in;

   a) Top test lengths for grams MT & Uster

   b) Test lengths for Grams Metre from each m/c
      (Uster Test Lengths should be carefully replaced in the can).

   c) Faulty Rovings from Finisher etc.

Waste from Roller Laps should not normally be re-fed nor should any other mass of fibre not in sliver form.

All effort to avoid Roller Laps - Faller Laps must be made by careful attention and well maintained machinery.

Waste targets for preparation i.e. 1st Autoleveller through to FM6 Finisher 1½%.

Use small Sliver Cans for waste collection. Paint Red for 1st shift - Blue for 2nd shift - Green for 3rd shift.

6) You have no recovery possibilities with spinning waste which falls into 2 categories, except of course by carding or sale;
   A) Soft waste
   B) Hard waste

   a) Soft waste: is derived from spinning end breaks into the pneumafil unit plus Roller Laps and Roving waste.

      Excessive Pneumafil & Roller Lapping - depend on good maintenance all round - in particular avoid damaging the Pneumafil Tubes. Use of correct spindle speed and ring traveller are important here.

      For your guidance at a given spindle RPM, too heavy a Ring Traveller will cause yarn breaks due to excessive tension. Whilst too light a Traveller will cause yarn breaks, by too light a tension - signs of this are snarling at the spinning tube head or on the twizzle guide.

      Give frequent checks on your spindle setting in relation to the Ring. This must be exactly centralised. Whilst a modern spindle rarely moves after setting - take care that when Ring Plates are removed for cleaning, they are replaced in the same position. Marking or Numbering of Ring Plates is desirable.

      If you experience Roving Waste through - badly made Bobbins - thick Roving - thin Roving - then check carefully your Finisher and Intersector Passages.

   b) Hard Waste: This is not normally of significant qu , in modern Ring Spinning. It originates mainly in -

      - An incorrectly seated Spinning Tube

      - Bad start up at the beginning of a Blend

      - Incorrectly set Lifter Rails or Plates.

      The latter two points will not be obvious until winding on your Schlafhorst Autoconer which will reject bits at start up of spinning or reject the whole tube for an incorrectly set Lifter Rail.

      Total waste Target initially 2%.

7) Winding Waste:- This is hard waste stemming from;

a) The Knotter Heads. A poor quality yarn with many breaks can increase this factor substantially.

b) Badly wound or incorrectly wound cones.

c) Faulty supply packages.

8) Assembling & Twisting:- Again only hard waste is involved and arises

a) From faulty or badly wound supply packages.

b) Incorrect alignment and tensions causing excessive end breaks

c) Badly made delivery packages and snagged come ends.

Total waste in this area target 1%.

9) Floor Sweeping:- This should be limited to fly waste. All Operators must wear bags and not deposit waste on the floor.

Watch for worn Ring Travellers and Separators in Spinning.

In 2 x 1 Twisting ensure correct Balloon Dia, by viewing with Stroboflash. Check that Automatic Lubricators are operating correctly at all times.

All the above if incorrect or neglected can and will induce excessive fly waste.

Target Minus 0'5%.

10) Waste should be collected daily and weighed. Keep soft waste and hard waste - floor sweepings separate. All qualities and different fibres should also be separated. Show on your daily production sheet:

Preparation	- Soft waste
Spinning	- Soft waste - Hard waste - Sweeping
Twisting & Winding	- Hard waste - Sweepings

11) Whilst Raw Material is the single largest cost factor, there are other expensive consumables which have the habit of becoming lost - stolen - or simply strayed.

Into this category falls:-

Stores	- Additives
Stores	- Roller cots and aprons
Stores	- FM6 Rubbers
Spinning Master	- Ring Travellers
Spinning Master	- Cyanoacrylate Adhesive for Aprons

Spinning Master	- Distance Pieces
Stores	- Oils & Grease in General
Spinning Master	- Spinning Tubes
Spinning Master	- Paper & Plastic Cones
Office Stores	- Stationery Requisities
Spinning Master	- Pneumafil Brushes
Spinning Master	- Spinning Hooks

All the above Items (and many more) should be carefully controlled, with the smaller items under the direct control of the Spinning Master.

a) Do not issue items such as Ring Travellers AD LIB.

b) Keep careful control of adhesives.

c) Distance pieces and condensors are often lost through laziness.

d) Do not over oil or grease. This is wasteful and dangerous. Stained yarn often results.

e) Do not issue new Pneumafil Brushes or Spinning Hooks, until the old ones are produced.

The above are for your guidance and again, the list is endless.

ABOVE ALL DO NOT WASTE TIME.

APPENDIX 1D

MATERIAL OR LOT SEPARATION

INTRODUCTION

In all factories there are one or more people, who can be described as Mr Nobody. These gentlemen are only present when mistakes and/or faults occur. This fact of life applies especially when we have mixed yarn on our hands. It's nobody's fault, nobody has seen anything. Everybody has followed his or her instructions. In short no one knows anything, and nobody is to blame.

There is no way we can allow matters to rest at that point. Immense and often irreparable damage can be done. Souring customer relations and at huge financial losses.

1:1 ORIGIN

The origin of mixes lies in the diverse number of fibres we are asked to process. Add to this that every lot of wool - every merge no. of any synthetic - must also be kept apart.

Different counts in the same fibre compounded by different twists i.e. hosiery and weaving only add to our problems. Even yarn twisted on Hamel twisting and Volkman 2 x 1, must be treated as separate individual lots, because of the different twisting action.

1:2 CAUSES

The causes of mixing lie in failure to record:-

a) Details of incoming raw material.

b) Inefficient storage of raw material.

c) Incorrect issue to production line of raw material.

d) Odd Tops lying around in Stores - Drawing or elsewhere including Superwash.

e) Failure in Drawing to separate by at least one machine, each and every lot.

f) Failure to ticket stock correctly, or not to ticket at all. This applies at all processes through to despatch.

g) Failure to alter machine process boards, in all sections of spinning department.

h) Test lengths or Bobbins sent to Lab and returned without identifications.

i) Samples from one Dept to another, without informing management of the dept. All samples should be carefully watched until returned to source.

j) Failure to read lot or blend tickets and to identify according to Bobbin or Tube colour, cone colour or hank tier.

k) Odd Bobbins - Tubes - Cones dropped and not immediately picked up.

l) Fibre contamination acrylic/wool - superwash/untreated will only by prevented by great care and cleanliness.

1.3 The list is endless. Mixes happen in the best of circles but careful organisation, training to follow the rules automatically can cut the risk to a minimum.

Any system depends on people. Failure to observe the rules by only one individual can lead to expensive chaos.

APPENDIX II

KNITWEAR FACILITY

PROCESS INSTRUCTION & RECORD

RAW MATERIAL LOT { QUALITY TYPE { MICRONS OR DENIER { MEAN FIBRE LENGTH {

FATTY MATTER _____ U% _____ % UNDER 40 mm _____ % UNDER 30 mm _____

GRAMS PER MT. REGAIN KILO's IN BLEND

SPINNING LOT NO. _____ STYLE OR TYPE _____ SHADE _____

COUNT _____ TWIST SINGLE _____ TWIST TWO FOLD _____ HANK/CONE _____

ADDITIVE _____ BREAKS PER 1000 SPINDLE HOURS _____

OPERATION	DOUBLING	DRAFT	STD GRAMS	TEST GRAMS	STD U%	ACT U%	RATCH	CONDENSOR	PRESSURE	BOBBIN COLOUR	KILOs REC'D	SOFT WASTE	HARD WASTE	SWEEPING	TOTAL
DE-PELTER											DRAWING				
1ST AUTO											FINISHER				
2ND AUTO											SPINNING				
1ST INTER											WINDING				
2ND INTER											DOUBLING				
F.M.6											TWISTING				
											HANKING				
											HANK TO CONE				
											KILO's DELIVERED		YIELD		

SPINNING	COUNT NOM.	COUNT ACT	TWIST NOM.	TWIST ACT	U% STD	ACT U%	THICK STD.	ACT. THICK	THIN STD	ACTUAL THIN	NEPS STD.	ACTUAL NEPS	ELONGATION	C.V.	SIGNATURE

TRAVELLER TUBE COLOUR

AUTOCONER	WINDING SPEED	CLEARER SETTING	CONE COLOUR	TENSION
ASSEMBLING OR WINDING	WINDING SPEED	CONE OR TUBE COLOUR	TENSION	
TWISTING	R.P.M.	CAPSULE	CONE COLOUR	

APPENDIX IIIA

MATERIAL HANDLING

1:1 Correct handling equipment should be provided for

Tops
Roving
Full & Empty Spinning Tubes
Cones etc.

Suggestions for trolleys etc, are included in this section.

1:2 TOP HANDLING: The area designated as tops store, is only accessable via post spinning, spinning and preparation areas. Alternative access could be provided via the service block entrance, passing between dyehouse of superwash, directly to the top store.

A low level hydraulic trolley of a suitable capacity is sufficient for transportation.

1:3 ROVING: We must get away from the continual handling and re-handling of roving. Two different trolleys are illustrated. Each of sufficient capacity to carry 124 roving bobbins (1 side). Loaded directly from the FM6 high speed finisher. Storage could be adjacent to the A. C. Plant in the spinning area.

1:4 SPINNING: Ideally spinning tubes should be doffed directly into containers suitable for feeding directly to Autoclave if desired. Carried on a low level trolley. Smaller containers clipped to each end, carry sufficient empty tubes for doffing.

1:5 CONES: Cones should be stored on a similar trolley to that used in roving. A slightly longer peg will enable two cones per peg to be carried.

Bear in mind that excessive handling of material is:

a) Totally non productive

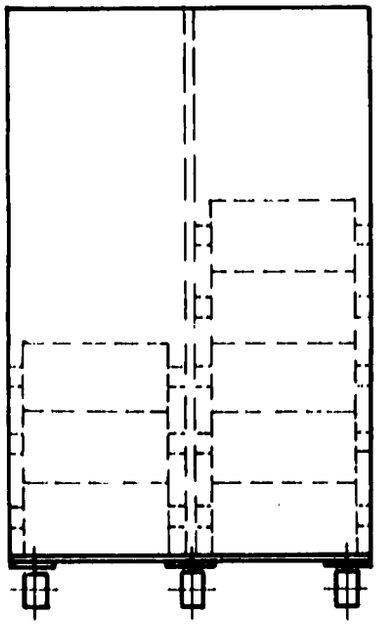
b) Contributes directly to waste

c) Contributes directly to inferior quality

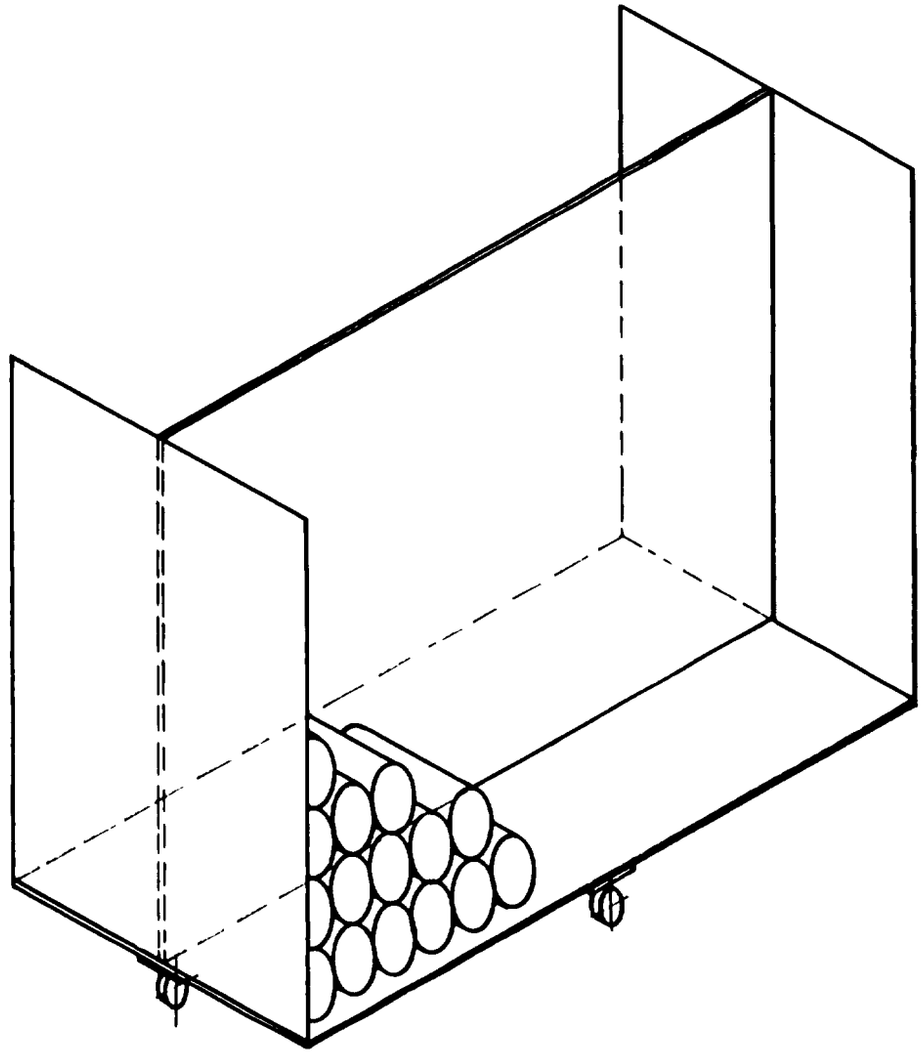
d) Makes winding more inefficient

1:6 Empty Bobbins - Tubes - Cones to be stored neatly in Bins.

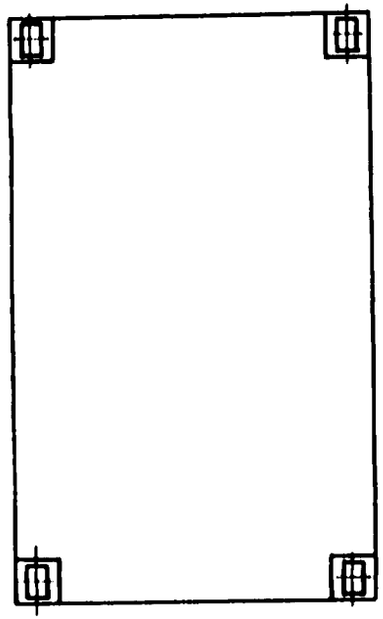
1:7 Plastic carts at present in use, are far too big and unwieldy. More especially as now a female labour force is involved. Requiring at least two females to move when full, and who cannot physically reach the bottom. Half this size would be ideal.



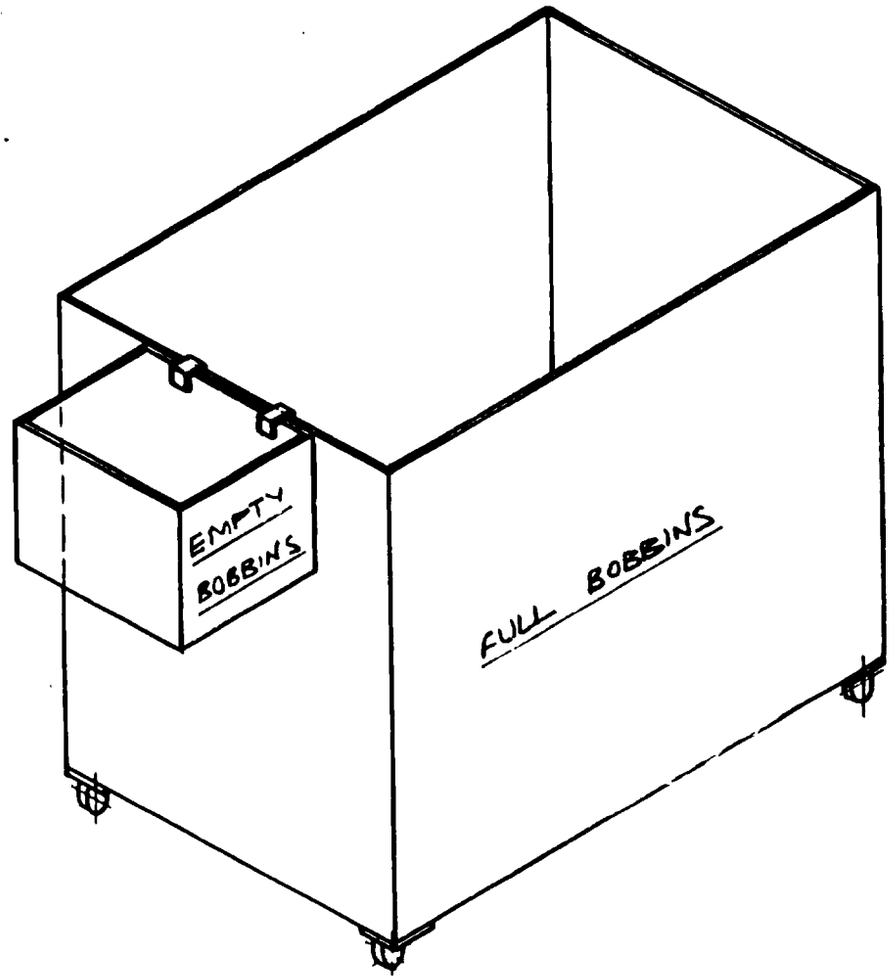
END ELEVATION



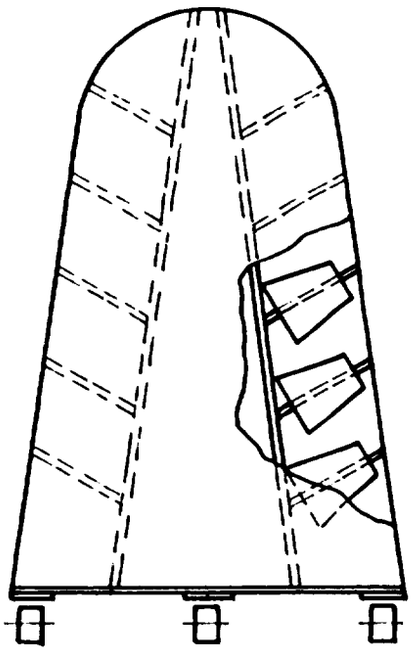
GENERAL ELEVATION



UNDERSIDE PLAN VIEW
SHOWING WHEELS



SPINNING BOBBING BASKET | TROLLEY



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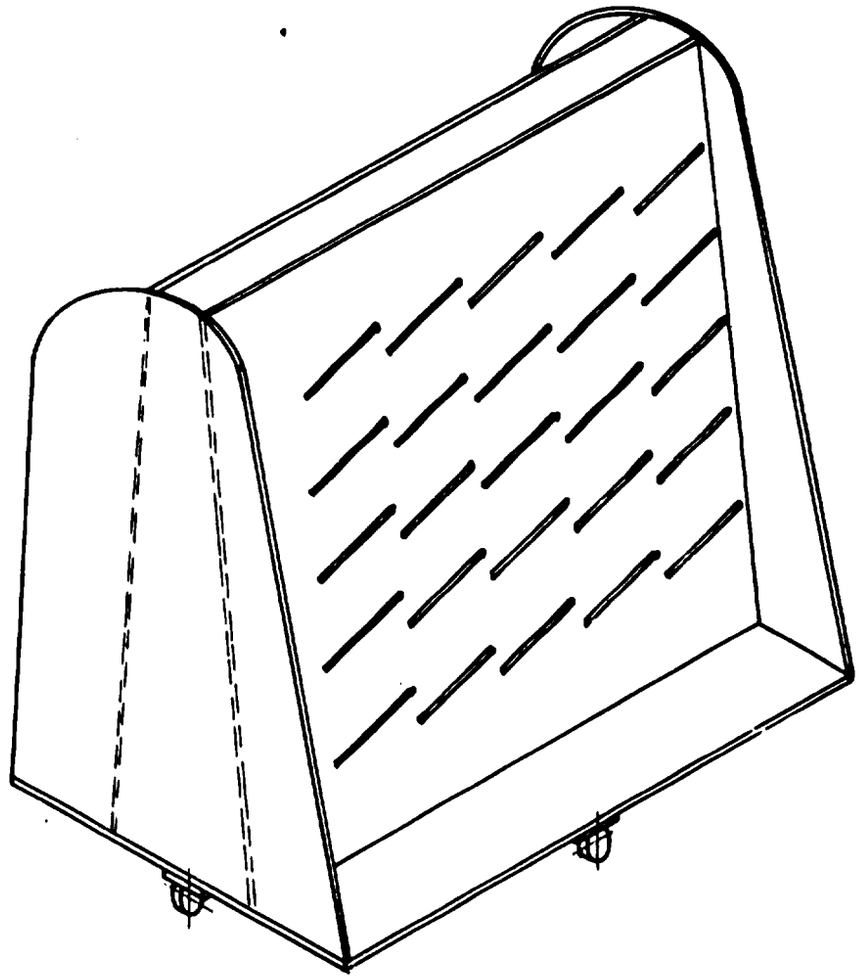
(PART SECTION)



GENERAL ELEVATION

APPENDIX IIIB

ELEMENTARY RAW MATERIALS FOR SUPERVISORS & JOBBERS

Time permits only an introduction to this huge and important subject. For our purpose we can group Raw Materials as follows:

a) Animal

b) Vegetable

c) Artificial

d) Synthetic

e) Mineral

a) Under this heading fall - wool - mohair - cashmere - angora - cow hair - horse hair - human hair etc.

b) The vegetable grouping includes cotton - jute - flax - ramie etc., with the exception of cotton. These are termed bast FIBRES.

c) Artificial Fibres are those with an organic origin i.e. Viscose Rayon - wood pulp, Acetate Rayon - cotton linters, Alginate Rayon - seaweed, Casien Rayon - sour milk, etc.

d) This grouping comprises the true synthetic/nylon - polyester - acrylic - polypropylene etc.

e) The two main mineral fibres are asbestos and glass.

Our main concern is with wool and it is to this fibre that we shall devote the majority of our available time. The domestic sheep has been around almost as long as man himself. Without doubt we can say that wool would be used as clothing by early man, in the form of sheepskin.

Wool is produced from many different breeds of sheep. Each having its own characteristic and end use. Some years ago it was reckoned that England alone had some 39 distinct breeds, making it an important producer os specialized wools.

By far the largest producer of fine wools however, is the Merino.

Main producing countries are:-

Australia
South Africa
South America

Whilst New Zealand produces a little, the climatic conditions are not ideal for Merino wool growing. On the other hand New Zealand is leading producer of fine bred wools, derived mainly from crossing the Merino with the Romney Marsh. Very usable wools indeed are produced, together with the added advantage of good meat.

Australia occupies the pre-eminent position in the growing of Merino wools, supplying by far the biggest share of the worlds market. Careful breeding and culling also puts Australia ahead in the quality stakes.

Wool sorting, formerly done on the fleece, after britching and skirting is now largely a thing of the past, with fleeces being britched and skirted, then simply classed. In general what is looked for in a good quality fleece are:-

a) Fibre fineness

b) Fibre length

c) Sound staple

d) Crimp

e) Vegetable matter

f) Yield

a) Fibre fineness is a measurement of fibre dia. The range being shown below.

American and British grading are shown together with average microns.

Source International Wool Secretariat

Wool Quality

Range in Avg. microns	British grading	Term	American grading
17'7-19'1	80's		Fine
19'2-20'5	70's		"
20'6-22'0	64's	Merino	"
22'1-23'4	62's		Half blood
23'5-24'9	60's		"
25'0-26'4	58's	Fine	Three eighths-blood
26'5-27'8	56's	Cross	"
27'9-29'3	54's	bred	Quarter blood
29'4-30'9	50's	Medium	"
31'0-32'6	48's	Cross	Low quarter blood
32'7-34'3	46's	Bred	"
34'4-36'1	44's		
36'2-38'0	40's	Low	Common
38'1-40'2	36's	Crossbred	Braid

The Britsh grading of 80s quality (17'7-19'1 microns) is normally the finest quality produced commercially. Although qualities as high as 100s (15'5-17'6 microns) are produced in small quantities.

Originally the British term was intended to indicate the maximum worsted count to the wool which could be successfully spun. Today and for a long time past this has not been true eg. most spinners would prefer a 64's quality 20'6-22'0 microns to spin 1/48s, some even the 70's quality.

b) Fibre Length is a very important element in spinnability. Together with Fibre Fineness forming a very big slice of the processing parameters of the suitability of a particular wool for spinning a given count.

c) Sound staple - The staple can be affected by disease and severe climatic conditions i.e. drought. A break in growth occurs and weakens the staple. Under process this would lead to an unacceptable level of fibre breakage.

d) Crimp refers to the waviness of the fibre and is described as Crimps per Cm. or crimps per inch. The finer wools having more crimps per centimetre than coarser wools. Of some aid in processing by providing interfibre friction, but its main effect is in the appearance and handle of the finished product.

e) Vegetable matter - mainly comprises of Burrs and Seeds. The amount can vary substantially according to the type of Pasture Sheep are run on.

Britchings and skirtings contain a far higher percent of vegetable matter than does the Fleece.

Good Fleece carries up to 2% v.m. whilst in Britchings and skirtings v.m. can be as high as 8%. In the case of Fleece, Burr Rollers fitted to the carding machine are sufficient to reduce v.m. to an acceptable level. Britchings and Skirtings however, are often carbonized prior to further processing. A Peralter Roller fitted to the Card Crushes the Burrs, which fall away as dust.

f) Yield - This is the actual weight of clean wool obtained after scouring etc. Natural grease and dust can vary according to Breed - Diet - Pasture.

Correct and accurate estimation of Yield is extremely important in wool buying, whilst this is still one of the wool buyers important assets. Today core testing etc., gives sufficiently accurate information for very reliable yields to be quoted. Different breeds of sheep produce wools which have a particular range of end usage.

Karakul
Fat Tailed
Welsh Mountain etc., being used as carpet types.
Lincoln being used for suitings and interlings.
Cheviots for Hosiery and Tweeds.
Merino for suitings or fine hosiery.

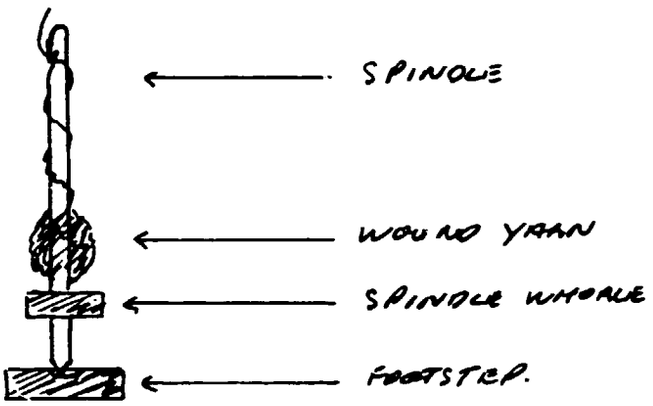
It is hoped sufficient interest will have been generated with this very brief talk, to cause your further study of the subject.

APPENDIX IIIC

INTRODUCTION TO YARN MANUFACTURE FOR SUPERVISORS AND JOBBERS

INTRODUCTION

Yarn has been manufactured from the earliest times by hand. Perhaps the First Spindle originated in Egypt some 4,000 years ago. Simply a round piece of wood pointed at the bottom, fitted with a round stone spindle Whorle. The Spindles, given impetus by hand, inserted Twist at the same time as the fibres were drafted by hand. The Spindle point eventually came to rest on a stone situated on the ground. Winding on of the resultant Yarn was then by hand, and the process repeated.



Development via the Spinning Wheel, Spinning Jenny and Mule, to fully mechanised spinning was rapid in the last century. Whilst the last 3 to 4 decades of this century has brought accelerated development.

The search for even more productive machinery and methods is still on, with the main impetus coming from the ever increasing labour costs.

Earlier this century and even up to the 1960's Worsted Yarn was spun on:-

Cap Spinning
Ring Spinning
Flyer Spinning
Mule Spinning

The more popular system being Cap Spinning and so on in descending order.

There were obvious mechanical limitations in the way of increasing package size and spindle speeds, both with Cap Spinning and Flyer Spinning, whilst the Mule suffered for the same reasons plus its very high labour cost.

The field was therefore open for developing Ring Spinning to its ultimate, and today it is not easy to forecast if the end of that development has largely been reached. Whilst there seems no reasonable limit to the mechanical speeds at which modern Ring Frames can be run. The mechanical properties of the yarn being spun, limit spindle speeds, to far below that which is MECHANICALLY possible.

PREPARATION

Before discussing the actual spinning process, we shall consider in brief the preparatory processes.

Two main systems used to exist. The French or Continental system, utilising the shorter wools and dry spun. Fibre control was by pins through to the Roving stage. The English or Bradford system used the longer type wools, oilcombed to 3% oil content. Fibre control after gilling, was by Twist.

Todays system could be said to contain elements of both systems. In all cases comprising a series of Gill Boxes or Intersectors, with one or more delivery heads. By means of repeated draftings and doublings the required Sliver weight is produced. Fibre control being by means of pinned fallers. Todays intersectors are precision made machines capable of 2,000 faller drops per minute and beyond.

After the final Gill Box, the resultant Sliver may be further processed in one of 3 ways.

a) Direct to the Spinning machine in Cans. This largely depends on the count of Yarn to be spun. This method is favoured in tne heavier count range.

b) Processed on a Flyer Rover, whereby further drafting takes place and the resultant roving is wound onto a positively driven Bobbin with a slight twist inserted.

c) This is favoured by many who still believe draft against Twist is an asset in producing a quality Yarn.

The degree of Twist inserted must be such as to make unwinding from the roving Bobbin feasible without roving breaks. On the other hand it must not be so high as to interfere with efficient drafting, which would result in TWITTY Yarn. The ability to estimate the correct roving Twist is one of the assets required by all preparation supervisors or managers.

c) The third method favoured by some because of its high productive potential and comparitive cheap initial cost is the Rubbing Rover or Finisher.

Capable of speeds up to 150 metres per minute cohesion is given to the fibres by means of reciprocating Rubbers, two ends per Bobbin is the norm making for reduced creeling on the Ring Frame, provided a suitable sized Bobbin is produced. Drawbacks to this system are:-

a) Sensitivity to fatty content which should not exceed 0'9% with safety.

b) Unless very careful handling is the norm at all times, fibre disturbance can result in subsequent Yarns faults.

BLENDING AND MIXING

From work done in the 1950's and 1960's, it was determined that a minimum of 400 doublings were required to produce an even distribution, this remains true today. The results were determined by mixing black and white wool tops in a variety of propertions and visually determining the effect in Knitted Fabric form. There is no doubt that Combing is the most efficient mixer and with todays trend towards the more vertical unit. Many spinners

today possess a re-combing unit, in which blending is carried out. This is certainly true of wool/polyester blends. Which must be comb mixed, if good results are to be obtained. Apart from mixtures of colour and different fibres, it is often necessary to blend different wools, in order to achieve the required specifications, at the right price. Whilst not as critical as blending colour and different fibres, one should nevertheless aim at as high a number of doublings as possible.

With the medium/short wools available, overdrafting is not advisable, rather you should aim at reasonable drafts and balance inputs and outputs to achieve maximum doublings. An example is given below:-

TABLE I

Machine	Sliver weight	Doubling	Total input	Draft	Output
Blender	20	8	160	8	20
Autoleveller	20	8	160	8	20
1st Intersector	20	4	80	7'2	11
2nd Intersector	11	3	33	6'2	5'3
Finisher	5'3	1	5'3	10'0	0'53

Total Doubling 768. Without Blender 96.

Your Blender may be fully occupied in processing material from the Super-wash process. The No. of doublings without the Blender would be 96. With the Autoleveller as a first passage, and intersectors in good condition, 96 doublings should not cause a deterioration in Sliver levelness. As has been in evidence time after time in practice. You should however, ALWAYS use the Blending passage for Blends of wool and synthetic.

Provided you have a suitable Raw Material you may increase doublings and drafts, and still experience no deterioration in yarn quality. You must remember at all times, that excessive spinning draft on short wools (despite various manufacturers claims), will definitely produce uneven yarn. Your roving weight must therefore be such as to avoid overdrafting in spinning, this is illustrated in Table I, where to produce 1/32 nm from a Roving of 0'53 grams, requires a draft of 17. With a longer wool doublings could be increased as in Table II.

TABLE II

Machine	Sliver Weight	Doubling	Total input	Draft	Output
Autoleveller	20	8	160	8	20
1st Intersector	20	5	100	7'7	13
2nd Intersector	13	4	52	6'9	7'5
Finisher	7'5	1	7'5	12'5	0'6

Total Doublings 160

we see we have 160 doublings as opposed to 96 (without Blender) in Table I. To produce 1/32 nm from a Roving of 0'6 grams requires a draft of 19'35. It is seen that the balance between doublings and the draft applied is critical. Our own experiments have shown, that given a good level top, reduced draft produces a more even yarn, as does additional doublings.

SUMMARY

Time does not permit us to go into the required detail, machine by machine.

The following Do's and Don'ts should be kept in mind:-

a) Give careful and daily attention to fallers. Bent or broken pins can be responsible for faller laps, increased waste and certainly yarn faults.

b) Keep all drafting Rollers in good condition. When the synthetic pressure roller becomes grooved and/or nicked, faulty Slivers will result, re-grind immediately.

   Inevitably you will have some degree of roller lapping. Take care when removing Laps from the steel drafting rollers, that the roller is not scratched. This results in excessive roller lapping. Always use a Hook for removing Laps NOT A KNIFE.

c) Your machines are fitted with broken end detectors, both back and front. Ensure they are in working order at all times. Faulty detectors create faulty Slivers, allow excessive lapping and may seriously damage your machine.

d) Check Autoleveller cone belts. If they become too pliable, faulty operation of the unit will occur, change immediately. Check regularly for easy movement of the memory rods.

e) Do not allow Tops to be placed on the floor, with Slivers pulled from the middle. This is one cause of reverse drafting additionally positive twist is inserted into the Sliver and causes excessive force to be used during drafting.

f) Check Finisher drafting rollers, drafting aprons and rubbers daily, remove any faulty pieces.

   Do not clean synthetic rollers and aprons with a petroleum product.

APPENDIX IIID

YARN MANUFACTURE II

FOR SUPERVISORS & JOBBERS

Today, possibly our last opportunity, we shall briefly discuss Spinning.

As we saw in the introductory notes, the majority of Spinning Spindles are of the Ring type. Our time restricts any discussion on other types of Spinning in use today.

Open end spinning has gained some ground in cotton spinning with the coarser counts. Until now, open end spinning has enjoyed little success in Worsted spinning.

Repco spinning, once hailed as the machine of the future, producing a self twist twofold yarn directly. The character of the yarn however, has found little acceptance in the markets. Cirospun on the other hand, has found a market in certain areas but is unlikely to interest KNITWEAR manufacturers. Cirospun is in its simplest form, double spinning, formed by passing two ends of roving through the drafting zone and uniting them at the twist point. A device ensures no singles spinning takes place. The process is highly productive and eliminates the twisting operation but we must remember the yarn is not a true twoply yarn as we know it i.e. Z Twist V's S Twist.

Air Jet spinning and open end friction spinning, are as yet very much in the development stage.

RING SPINNING - The machine comprises a roving creel, drafting rollers, a means of fibre control, usually double Apron. Various guides Spinning Ring, Spindle.
Recent developments have taken place in :-
Increased spindle speeds.
Automatic doffing such as Co-We Mat, increasing machine length up to 1,000 spindles. Roving rings, aimed at further increasing speed.
Computorised recording of stopped time.
Roving end break devices for reduced waste.
Of these developments it is felt that not many have a real application in developing countries. Rather they are aimed at Countries with high wages cost.

Automatic doffing is one such development. Whilst machines of 1,000 spindles are only applicable to factories having say 15,000 spindles plus, with long runs of the same count and quality.

The revolving ring allows some increase in spindle speeds but it is felt by many that the added complication plus increased capital cost, offset any advantage.

In my own view computerisation, except under PARTICULAR circumstances, tends to reduce management involvement at shop floor level, a fact in itself which has nothing to commend it. Roving end break devices can be fitted in order to prevent waste on an end break occurring. Again, unless operators are overloaded, benefit is in doubt, creating as it does, reliance on a device and decreasing operator awareness.

ZINZER 319 L is the machine you have. Given all the necessary gear wheels, you have a draft range from about 9'5 to 53. Far wider than you will ever use.

Twist range is from 196 to 783. COUNT RANGE is claimed to be 1/12 nm to 1/60 nm. I do not advocate trying to take advantage of this range. Your maximum efficiency lies between 1/24 nm to 1/48 nm.

SPINDLE SPEEDS are obviously affected by the spinnability of the material. This factor can reduce efficiency substantially is the count becomes too fine.

On the other end of the scale, a point is reached where correct piecening becomes impossible due to delivery speeds. This can vary considerably and depends on the quality of the operators. In your case at K.F. I suggest a delivery speed of 23 mts a minute is a reasonable ceiling for quite some time to come.

Given below are some typical spindle speeds by way of Example:-

Count	TPM	Delivery in mts min.	Spindle R.P.M
1/32	450	23	10350
1/24	390	23	8970
1/20	350	23	8050
1/16	320	23	7360
1/12	200	23	4600

Also affecting efficiency in the heavier count range are the much increased stoppages due to doffing.

Whilst in the finer count range a maximum spindle is reached when you run out of Travellers, that is to say the angle of tangential pull is such, end breakage reaches an unacceptable level.

The angle of tanential pull is also dependant on the relationship of Ring to Spinning tube Dia. There are those who use a specially made spinning tube, with an increased diameter for finer count spinning. This is not advocated as spindle balance and therefore life, is affected.

TWIST can vary with the fibre being spun. In theory the Twist should be the minimum required for a good spin, it is not practical to vary twist too much either more or less. It must be kept in mind that twist is one of the Yarn characteristics, which can alter the appearance of the knitted or woven fabric. You should therefore, determine your Twist levels by means of a Twist Factor. This varies somewhat from mill to mill, according to the spinnability of the raw material, condition of machinery and the ideas of management. At K.F. I have advocated a twist factor 82 for Hosiery Yarns and 85 for Weaving Yarns.

Turns per metre are determined by twist factor square root count. This formula has produced very satisfactory results until now. I suggest you keep to it.

Twofold twist is another matter entirely and depends on the end use to which the Yarn is to be put i.e. Hosiery - Weaving - Gaberdine - Marl etc.

DRAFT - This is provided by SKF and is the P.K. 1602 SLIP DRAFT type. For your present product range I recommend for wool, Drafts between 13 and 17 and for acrylic 23 and 28.

whilst it is possible to adjust the ratch within narrow limits, with the normal mean fibre lengths normally processed, you will find tests show little advantage either one way or other.

The system is provided with double aprons and a recessed top apron roller, to allow slip drafting to occur. Check the slip draft rollers regularly. Faulty Rollers produce faulty Yarn.

The apron cradle is fitted with a distance piece on its leading edge. These are of varying sizes and are interchangable. The apron gap at the point of drafting, is increased or decreased by this means, again unless a combination of extremes occur, test results indicate no significant difference between the three distance pieces.

Your Zinzer 319 L will give you many years of good service, if properly maintained and at high efficiencies if the ground rules are followed.

APPENDIX IV

SPARE PARTS AND CONSUMABLES

1.1 Using a combination of makers recommendations and personal experience values. Spare parts have been prepared for ordering to cover the facilities requirements to end 1986 and submitted.

ADDITIVES

2.1 It is of great importance to have the correct additive for the job if good results are to be obtained and maintained.

As it is the intention to process:-

a) 100% wool
b) 100% Acrylic
c) Blends of wool & acrylic
d) Blends of wool polyester

A good general purpose additive is required, applicable to all fibres. This avoids confusion and application of the wrong additive in error. A number of such additives are available, and are applicable to all processes where an additive is normally applied i.e. superwash - blending - autoleveller.

2.2 Duroslip 1410 - Supplied by J. T. Thompson, Bradford, England.
Crosslube CL - Supplied by Crossfield (Chemicals) Ltd., Warrington, England.

Application rate is normally:-

1. Part Additive
2. Parts Water

With a spray rate of 2% Emulsion your consumption would be 5 Kilos of additive to 1,000 Kilo's material. According to the production requirement in spinning

Period	Kilos expected	Kilos Additive	Stock Required
Sept to Dec 85	54487	272	2 Barrels
Jan to March 85	53405	267	2 Barrels
April to June 85	95081	475	5 Barrels

2.3 Stocks of 5 Barrels should be maintained at all times - plus your superwash requirement as yet not determined. These additives contain their own anti-static and it should not be necessary to add further anti-static. However, emergencies do occur and a stock of 50 Kilos Nopcotat LV 40 could be maintained.

2.4 J. T. Thompson, Bradford, England also supply first aid in the form of aerosol cans. Duroglide which is an anti-static powder and an anti-static spray. Both provide excellent emergency treatment for difficult lots. Stocks of 12 cans each could be maintained to advantage.

2.5 Fugitive Tinting is absolutely essential when processing a wide range of qualities and counts. To ensure no mixing occurs, tint for acrylic is easily made up in your own dyehouse. For wool however, we have yet to find a suitable tint locally.

Again J. T. Thompson of Bradford stock tints in liquid form, which are diluted on site, to the colour depth required 0'5% on weight is recommended. I suggest you stock the following:-

a) Pink
b) Blue
c) Lime LF

Utilizing these colours a wide range of shades can be made up by mixing the different colours. After trials I suggest you stock 1 drum (200 Kilos) of each colour.

2.6 Volkman coning oil, two for one twisting requires a coning oil to prevent excessive dust. Take due care that a lubricant which is scourable and stable is used. A good woollen blending oil such as Vickers Carmene, Leeds, England, is well tried and tested.

STOCK ONE BARREL:

CONSUMABLES

Faller pin strips, Faller pinning varies with material being processed. As of now your general scheme of faller pinning will suffice. I suggest however, that you carry a spare set of fallers for the second intersector, pinned to 6 pins per cm. Supplier Drie-S-Weak, Germany.

Your stock should be:-

De-Felter	2'5 pins cm.	500 pieces
Blender	5 pins cm.	500 pieces
Autoleveller	5 pins cm.	500 pieces
1st Intersector	6 pins cm.	500 pieces
2nd Intersector	7 pins cm.	500 pieces

Faller strip glue 50 bottles "A" 50 bottles "B".

3.2 Ring Travellers, your normal range of Ring Travellers will probably run from 19-25. With perhaps the odd call for 16-26-27.

The following stocks are suggested:-

from No. 21 - 25	10 boxes
19, 20 - 26	5 boxes
18 - 27	2 boxes

Reiners & Furst, Germany are reliable suppliers.

3.3 Cots and drafting aprons should be available locally of Armstrong technology. Stocks should be:-

Gill box pressure roller cots	10 pieces
Gill box rubber tubing	25 pieces
Gill box suction strip	25 pieces
FM6 drafting aprons top	32 pieces
FM6 drafting aprons bottom	32 pieces
FM6 suction strips	100 pieces

FM6 back roller cots	6 pieces
FM6 front roller cots	6 pieces
FM6 rubbers	10 pieces
Zinzer top drafting aprons	500 pieces
Zinzer bottom drafting aprons	1000 pieces
Zinzer roller cots	250 pieces
Cyano acrylate Adhesive	10 bottles
Volkman Drum rubbers	25 pieces

4.1 CONES

Plastic cones are prefered for internal use. 20,000 pieces, 4 colours, 5,000 per colour. Depending on price paper cones may be prefered for delivery to customers. A stock of 50,000 pieces should be maintained.

APPENDIX V

WORK LOAD & LABOUR COMPLIMENT

Two Spinning Masters:-

a) Spinning Master (T) - responsible for planning - quality control - technical development and technical assistance etc.

b) Spinning Master (P) - responsible for production - labour control - maintenance - operator training etc.

Are already installed:-

An Assistant Spinning Master with direct responsibility for maintaining the maintenance schedule is also in position.

A trained Autoconer Mechanic is a must. Such a person is in extremely short supply locally. KF will have to take advantage of Schlafhorst training courses held in India once or twice a year.

All other designations are self explanatory.

RECOMMENDED LABOUR

RESPONSIBILITY OF JOB	3 SHIFTS			1 SHIFT			SHIFTS/TO BALANCE		
STAFF	No Req.	No of Shifts	Total req.	No req.	No of Shifts	Total req.	No req.	No of Shifts	Total req.
SPINNING MASTER (P) AND (T)	2	-	2	2	-	2	2	-	2
ASSISTANT SPINNING MASTER	1	-	1	1	-	1	1	-	1
SUPERVISORS	1	3	3	1	-	1	1	2	2
CLERK - TESTER	1	-	1	1	-	1	1	-	1
WORKER									
GENERAL TOPS ROVING	1	3	3	1	-	1	1	2	2
MECH. DRAW/SPIN	1	3	3	1	-	1	1	2	2
MECHS. TWIST/WIND	1	3	3	1	-	1	1	2	2
CLEANER/SWEEPER	1	3	3	1	-	1	1	2	2
DE-FELTING BLENDING	2	3	6	2	-	2	2	2	4
PREPARATION	2	3	6	2	-	2	2	2	4
FINISHER	1	3	3	1	-	1	1	2	2
SPINNERS	7	3	21	7	-	7	7	2	14
WINDERS (AUTO)	2	3	6	2	-	2	2	3	6
HIRSCHBURGER	1	3	3	1	-	1	1	3	3
MELTER	2	3	6	2	-	2	2	3	6
TWISTING VOLK	1	3	3	1	-	1	1	3	3
HAMEL 1-2	4	3	12	4	-	4	4	3	12
REELING	6	3	18	6	-	6	6	3	18
REPCO & YARN PACKING	3	1	3	2		2	3	1	3
			106			39			90
% Absentees 5%			5			2			4
Holidays @ 355 days			5			3			4
15 days off 5%	Total		116			43			98

APPENDIX VIA

DAILY PRODUCTION ANALYSIS

Date: _____

SPINNING

EXPECTED KILO'S 1/40	%	ACTUAL KILO'S	AV. COUNT	AV. TPM	ACTUAL 'H'
1999[A]	20				

KILO'S	% M/C	STANDARD[B] AVAILABLE MINS
		20160 (8 SIDE)

NO. OF DOFFS	TIME	NO. OF CHANGES	TIME	MAINT-ENANCE	TIME	BREAK DOWNS	TIME	POWER[C] FAILURE	TOTAL TIME

ACTUAL B - C MINS AVAILABLE	% MINS LOST	% KILO'S LOST	KILO'S EXPECTED ACTUAL TPF	% EFF AT ACTUAL

TOTAL WORKERS	TOTAL HOURS	PRODUCTIVITY

KILO'S F.M.É	KILO'S SCHLAFHORST	KILO'S HIRSCHBURGER	KILO'S METTLER	KILO'S VOLKMAN	KILO'S HASLE I ST	KILO'S HASEL II

SOFT WASTE PREP-ARATION	% WASTE	SOFT WASTE SPINNING	% WASTE	HARD WASTE SPINNING	% WASTE	

SWEEPING	% SWEEP	HARD WASTE TWISTING/WINDING	% WASTE	SWEEPING TWIST/WINDING	% SWEEP

SUMMARY

ACTUAL KILO'S SPUN	KILO'S CONVERT TO 1/40 Nm	TIME LOST	% MACHINE EFFICIENCY	EFFICIENCY % ACTUAL TIME
	TOTAL % WASTE			

APPENDIX VIB

EFFICIENCY & PRODUCTIVITY

INTRODUCTION:

Spinning is always regarded as the productive unit in any yarn manufacturing unit. Should we not feed ring spinning sufficient roving from drawing, they cannot produce. Similarly if winding & twisting create a bottle neck then again the spinning spindle is idle.

When calculating any efficiency or productivity it must be against the spinning spindles.

DAILY ROUTINE

You have received weight record sheets for each section. Weight must be recorded shift by shift with a daily total. These weighings should enable you to discern out of balance sections and take immediate steps to overcome the problem.

DAILY ANALYSIS

The production of every Section must be recorded on the analysis sheet. Worker hours, waste & sweepings must also be recorded. Spinning production is analysed for:

		Target
a)	Machine efficiency	95%
b)	Worker efficiency	85%
c)	Productivity	2'8 Kilo's per man hour

MACHINE EFFICIENCY

Any spinning department produces.

1) A range of counts and twists. It is necessary to have a norm by which efficiency can be measured, whatever the count being spun. This can be termed "K" factor. It is derived from the average count x average twist ÷ 1000.

   Average count and twist can be determined say over 6 months running. For our exercise we assume average count 1/40 - average T.P.M.500. This means we have a "K" factor of $\frac{40 \times 500}{1000} = 20K$

2) Once we know the production required at 100, we can calculate machine efficiency, whatever count and twist is in process. Target average spindle speed is 8000 R.P.M.

   Than $\frac{8000 \text{ RPM} \times 60 \text{ min.} \times 24 \text{ hrs.} \times 3477 \text{ spindles}}{40 \text{ Nm} \times 500 \text{ TPM} \times 1000}$

   = 1999 Kilos @ 100%

3) For example we have 7 ring spinners. If a typical 24 hrs production was as follows:-

M/C	Kilos	Count	Twist	Ct x Kilo	TPM x Kilo
1.	244	1/40	500	9760	122000
2.	251	1/40	500	10040	125500
3.	242	1/40	500	9680	121000
4.	365	1/32	420	11616	152460
5.	371	1/32	420	11872	155820
6.	290	1/36	480	10440	139200
7.	293	1/36	480	10548	140640
Total	2054			73956	956620

So Ct x Kilo $\frac{73956}{2054 \text{ Kilo}}$ = 1/36 avg. ct.

Ct x Twist $\frac{956620}{2054 \text{ Kilo}}$ = 465'7 avg. TPM

$K = \frac{1/36 \times 465'7}{1000}$ = 16'76 actual

4) Having arrived at actual "K" factor (16'76), we can calculate our efficiency pro-rato to 1/40s thus:-

$\frac{2054 \text{ Kilos x actual 'K' } 16'76}{\text{'K' } 20}$ = 1721'2

And therefore our machine efficiency

$\frac{1721'2 \text{ Kilos}}{1999 \text{ Kilos expected at } 100\%}$ = 86' 1% EFF

WORKER EFFICIENCY

5) We are all aware that all machines must stop for various reasons. These being doffing, lot changes, maintenance, breakdowns, power failure etc.

In order to arrive at worker efficiency, we must take these stoppages into account.

a) Allow 2 minutes per side per doof.
b) Allow 60 minutes per lot chance.
c) Maintenance - Breakdowns - Power failure at actual time.
d) If we have 82 doffs x 2 mins per day. Enter 164 mins under doffing time.
Say 2 sides change lots = 60 mins x 2 = 120 mins
Enter this under changes
Enter other stoppages at actual time and total
In this example, we have no stoppages other than doffing and changes = 284 mins total.

6) Standard minutes of 20160 (by side) minus 284 minutes stopped time - 19876 mins for production or 1'42% loss. 28'3 lost.

The actual Kilos expected therefore is 1999 Kilos - 28'3 Kilos = 1970'7 Kilos.

So $\frac{1721'2 \text{ Kilos x } 100}{1970'7 \text{ Kilos}}$ = 87'33 at worker efficiency

PRODUCTIVITY

It is often argued "Give us more Workers". This is more often than not of little help and plays havoc with our productivity.

To calculate your productivity you need total hours worked by all workers.

In our case you have been allotted 86 persons. Assume you have 3 absent then 83 x 8 hrs = 664 hours.

1721'2 Kilos at 664 hours 1/40 Nm. = Productivity of 2'59 Kilo per hour

APPENDIX VII

SUGGESTED ROUTINE QUALITY CONTROL APPLICABLE TO THE WORSTED SPINNING AREA

Following are suggestions for Routine Testing in the spinning area. For practical purposes tests have been kept simple and to a minimum. They may be added to or subtracted from as experience values are built up, as time passes. Taken in conjunction with the process card, they will together provide ample cover for ensuring a satisfactory performance.

RAW MATERIAL

It is important that raw materials are purchased to a set of standard parameters, arrived at by

a) What is available
b) What is suitable for a particular end use
c) Calculation of the costs involved.

On delivery the raw material must be subjected to tests, designed to show that the parameters requested are indeed present, within fairly narrow limits.

1) Check delivery at random for actual regain. Compare with invoiced weight.
2) Check grams per metre. Using a 5 metre test length under constant tension.
3) Check average micron value (Fibre Fineness Meter).
4) Fibre diagram Mean-% under 40 mm-% under 30 mm.
5) Total fatty matter.
6) Nep count & VEG matter.
7) U% value.

PREPARATION OR DRAWING

1) Check grams per metre delivered. Test length 5 metres. Use scissors for square edge. Tolerance from SPEC ± 5%.

2) U% value, compare to standard on process card, only when U% value conforms to standard will production be allowed to proceed. Except by permission.

3) Check % Additive.

The above tests apply to M/c - 1 First Autoleveller, M/c - 2 2nd Autoleveller M/c 3 Intersector, M/c 4 Intersector.

4) On M/c 4 intersector % fatty matter should be periodically checked.

   The FM6 finishing accepts 0'7 - 0'9% fatty matter and is often shown to be critical.

5) FM6 Finisher

   Check grams per metre. Test length 25 x 2 metres. Use Roving Reel, ± 2% from standard. U% value to be checked against standard. Use 2 spindles for control. No tolerance allowed.

The foregoing tests to be applied at the commencement of each blend. With blends over 5000 Kilo's repeat for every 5000 Kilo's in blend.

FM6 Finisher should receive monthly U% control on all 16 spindles.

SPINNING

1) Run 4 spindles only with the correct twist wheel for requested TPM. The draft wheel according to the required draft spin approximately 300 metres.

2) Check the 4 Bobbins for Count by reeling 4 x 100 MTRS on your count reel. Calculate any adjustment necessary and change the draft wheel.

   Commence spinning and further check the count. Tolerance 2% heavy 1½% light.

3) Keep a hard backed book in which are recorded the machine and side - the shift - the date.

   A routine check on counts must be made at the commencement of each shift and recorded test as before 4 x 100 MTRS.

4) From the first doff spun and from all new blends take 4 full tubes and check the U% - thick places - thin places - neps.

5) Twist tests in singles are often unreliable but initially at least check and record the TPM, at least 50 tests are required to provide a reliable result.

6) When processing 100% wool, check the yarn for strength Elongation - CV of strength and record.

7) Where possible a knitted length of singles yarn is advisable. View in front of diffused light. It is an excellent guide to the end product.

TWISTING

1) From the first Doff Twisted Check the count 4 cones x 50 Metres. Tolerance 2% heavy - 1½% light, unless there is cause for suspicion. No further checks should be necessary.

2) Check for TPM 20 Tests to provide mean on each machine started.

3) Check for strength - Elongation - CV of strength.

4) Further tests as required may be carried out from time to time i.e. Hairiness - Friction.

5) Digimat tests should be carried out to deterine:-
   a) Faults and origin in Singles
   b) Effectiveness of cleaning in cleared yarn.

   In general do not use the Digimat for Clearer setting. Clearers should always be keen for the count being processed.

APPENDIX VIII

MAINTENANCE AND LUBRICATION

The following recommendations are experience values and take also into account makers recommendations. Every effort has been made to:-

a) Provide for faults to be discerned immediately.

b) To keep machinery free from fly waste, dust and thread waste.

c) To keep oils and greases to a minimum variety and which are easily available.

It should be borne in mind that many grease and oiling points, can be safely reached while the machine is in motion. This should be done where possible - Better lubrication results.

The plan is based on 24 hour running and should be adjusted pro-rata for different running hours.

Remember that standing machinery allows oil to drip off. Grease can deteriorate. Care should be taken to ensure correct lubrication, if only intermittent running is possible.

Certain settings may also change. Especially if under pressure or weight. These should be checked periodically. Check alignment by line band and spirit level once annually. Some setting may occur.

Below is given a simple stock card for the maintenance of stocks.

SPARE PART STOCK CARD

DESCRIPTION M/C NO.

MINIMUM STOCK MAXIMUM STOCK

Initial Stock	Date	Issued from stock	Date	Balance	Rec'd into stock	Date	Final Balance

DE-FELTER INTERSECTOR AUTOLEVELLER

MAINTENANCE & LUBRICATION

MACHINE PART	FREQUENCY	LUBRICANT
Check all pressure Rollers for Wear, Damage - Fallers	Daily	-
Check all Guides - Cans for damage and alignment	Weekly	-
Autoleveller Cone Belt for damage and see it is functioning correctly. Check Memory Rods for freedom of movement	Weekly	-
Check Variator through its complete range. Check all Pinions & Slides	Weekly	-
Suction Scrappers etc check for wear	Weekly	-
Empty Suction Box as required	As necessary	-
Clean Suction Box Filter	Weekly	-
Coiler Drive Gearing & Belts	Monthly	-
Check Oil in Tank. Keep at correct level	Monthly	Any good gear oil

FM6 FINISHER LUBRICATION CHART

MACHINE PART	FREQUENCY	LUBRICANT
Rubbing Rob Bearings	Daily	Vitrea oil 37
Front Roller Bearings	Daily	Vitrea oil 37
Winding Guide Rod Bearings	Daily	Vitrea oil 37
Winding Guide Rod Drive	Daily	Vitrea oil 37
Timken Bearings	Bi-monthly	Alvana Grease R2
Intermediate Rubbing Rod	Bi-monthly	Alvana Grease R2
Needle Bearings on Rubber	Bi-monthly	Alvana Grease R2
Knuckle Joints	Bi-monthly	Alvana Grease R2
Rod Feet Bearings	Bi-monthly	Alvana Grease R2
Main Drive Conical Gears	Bi-monthly	Alvana Grease R2
Rubbing Counter Gear	Bi-monthly	Alvana Grease R2
Pneumatic Points	Bi-monthly	Tellus Oil 27
Back Roller Bearings	Bi-monthly	Vitrea Oil 37
All Driving Chains	Bi-monthly	Vitrea Oil 37
Front Draft Roller Drive	Bi-monthly	Vitrea Oil 37
Front Roller Drive	Monthly	Alvana Grease R2
Headstock Gears	Monthly	Alvana Grease R2
Traverse Conical Gears	Monthly	Alvana Grease R2
Elliptic Gear Rollers	Monthly	Alvana Grease R2
Elliptic Gear Crank	Monthly	Alvana Grease R2
Balancing Drive Gear	Monthly	Alvana Grease R2
Variators	Monthly	Alvana Grease R2
Transverse Shaft Bearings	Quarterly	Alvana Grease R2
Rubbing Shaft Bearings	Quarterly	Alvana Grease R2
Main Motor Bearings	Quarterly	Alvana Grease R2
Long Shaft Bearings	Quarterly	Alvana Grease R2
Counter Drive	Quarterly	Vitrea Oil 37
Draft Apron Shaft Bearing	Quarterly	Vitrea Oil 37
Variator Drive Bearings	Quarterly	Vitrea Oil 37
Winding Mandrels	Quarterly	Tellus Oil 27
Compensation Cam Bearings	Quarterly	Vitrea Oil 37
Winding Roller Bearings	Quarterly	Vitrea Oil 37
Torque Limiter Winding Motion	Quarterly	Vitrea Oil 37
Head Stock Bearings	Quarterly	Vitrea Oil 37
Traverse Guide Bearings	Yearly	Alvana Grease R2
Compensation Cams	Yearly	Vitrea Oil 37

FM6 HIGH SPEED FINISHER

Suggested Maintenance:

Draft Apron Cradles:- Dismantle Cradles every 8 weeks. Clean all Rollers with Petrol. Do not get Petrol on Draft Aprons. Use Vitrea Oil 37. Avoid oil on Draft Aprons, it will cause lapping.

For any other settings refer to your Manual.

ZINSER RING SPINNING LUBRICATION & MAINTENANCE

MACHINE PART	FREQUENCY	LUBRICANT WHERE APPLICABLE
Check top roller cots p.p and bottom aprons. Clean apron tension bracket. Clean clearer rollers. Check no broken separators	Daily	-
Open front covers over tangential belt. See belt is not damaged. Clean Belt Box with blower	Weekly	-
Clean motor filter cage		
Check everytime you change gears or at least once per week. If sufficient oil is dripping and filter is clean	Weekly	-
Remove all fly on guide rods and lifter pulleys. Check lappets and balloon control rings for alignment	Monthly	-
Tooth belt drive-bevel gear drive and bearings	Monthly	Alvana Grease R2
Spur and bevel gears	Monthly	Alvana Grease R2
Belt driving pulley bearings	Monthly	Alvana Grease R2
Lifter motion lever	Monthly	Vitrea oil 37
Counter weight chain on weight frame	Monthly	Vitrea oil 37
Clean Tangential Belt. Use weak alkaline dye	Quarterly	-
Change headstock oil	Quarterly	Shell vitrea 41
Cam Bearings	Quarterly	Alvana grease R2
Upright Shaft	Quarterly	Alvana grease R2

MACHINE PART	FREQUENCY	LUBRICANT WHERE APPLICABLE
Worm drive for upright shaft	Quarterly	Vitrea oil 37
Cam followers. Crank drive and bearing on builder unit	Quarterly	Alvana grease R2
Lifter chain for ring rail	Quarterly	Alvana grease R2
Examine Bobbin Holers	Half yearly	-
Check spindles for true run and alignment to rings	Half yearly	-
Builder Motions	Half yearly	Vitrea oil 37
Spindles. Use lubricating unit	Yearly	Tellus oil 37
Pressure rollers Tangential belt	Yearly	Alvana grease R2
Top roller bearings bottom roller bearings	2 years	Alvana grease R2

SCHLAFHORST MAINTENANCE & LUBRICATION

NOTE:-

Your Schlafhorst Autoconer is a piece of precision engineering given reasonable care it will give little trouble. Neglected however, it will produce faults such as:-

Bad Knotting
Fail to cut knot ends etc.
Spoil cones by trying but failing to pick up thread
Increased waste
And of course run at a very low efficiency
The machine should be set carefully to eject spinning
Tubes after 3 successive failures to knot
Study your manual carefully it will give you a first class idea of the cycle of operations. Take care however, in relying on its service and maintenance section, which is very weak.

I suggest the board of maintenance instructions, now adjacent to the machine, should be discarded and the following substituted.

MACHINE PART	FREQUENCY	LUBRICANT
Remove yarn waste etc, from suction box	As required but at least every shift	-
Blow down all working parts with clean compressed air	Every shift	-
Use fine cleaning brush on knot testers. Check knotter Brush	Every shift	-
Examine winding drums for cuts	daily	-
Check knotter for correct operation i.e. knotting, pick up, rejection, transfer	daily	-
Check all cleaners for correct operation	daily	-
Remove one knotter head, clean thoroughly, oil with molibdenum type oil	three days	Moly slip
Check tension device. Top and bottom scissors etc	Weekly	-
Open up and clean friction pulley housing etc. Use clean compressed air	weekly	-
Clean motor sleeves to prevent over heating	weekly	-
Remove knot tester, clean thoroughly	monthly	-

MACHINE PART	FREQUENCY	LUBRICANT
Check all belts for wear and tension	Monthly	-
Check brake linings	Monthly	-
Oil or grease all moving parts hinges etc. Use the oil can provided by Schlafhorst	Monthly	Shell vitrea oil

VOLKMAN 2 x 1 TWISTING MAINTENANCE AND LUBRICATION

MACHINE PART	FREQUENCY	LUBRICANT
Clean all fly and dust	every	-
Check rubbers on winding roller	Daily	-
Check pre-take up rollers	Daily	-
Check position and condition of yarn detector wires	Daily	-
Yarn guides and trave guides	Daily	-
Check yarn lubrication reservoirs	Daily	-
Check yarn reserve discs for accumulated waste	Daily	-
Check all cones for X winding	Daily	-
Check alignment of cone to drum	Daily	-
Remove all guards and clean machine thoroughly	Monthly	-
Empty all yarn lubricators dismantle, clean and refill	Monthly	Use only a suitable oil Vickers carmene
Clean all pots and balloon restrictors	Monthly	-
Check all belts for conditions and tension	Monthly	-
Check all spindle brakes	Monthly	-
Check all gears in gear box	Monthly	-
Check all spindle brakes	Monthly	-
Check level and condition of oil	Monthly	-
Check balloon with stroboscope. Balloon must not contact upper edge of pot. To adjust check your manual	Monthly	-
Check all spindles for RPM Variation must not exceed 0'5%	Monthly	-
Check cone adaptors. Clean and lightly grease	Quarterly	Shell Alvana R2
Grease all pot bearings	Quarterly	Shell Alvana R2
Examine all gear-oil pumps distribution plates etc.	6 months	-

MACHINE PART	FREQUENCY	LUBRICANT
Check surface of ball limiters	6 months	-
Lubricate belt tensioning device	6 months	Alvana R2
Check spindle oil, rinse and re-fill	Yearly	Tellus 27
Belt guide rollers, empty, rinse and re-fill	Yearly	Tellus 27
Gear box, empty, examine, re-fill	Yearly	Shell Vitrea 41
Clean away oil fly and dust	Every Shift	-
Check alignment of cone to drum	Daily	-
Check yarn stop motions	Daily	-
Check yarn guides and drums	Daily	-
Check cones for X winding	Daily	-
Check cones for bearings	Daily	-
Check engagement of winding head	Daily	-
Grease all bearing	half yearly	Shell Alvana R2
Check V. Belts for wear and tension	Monthly	-
Clean and lightly lubricate cone holders	Monthly	Shell Alvana R2

Remember here perfect cones are required at all times. To prevent spiral yarn and excessive waste.

HAMEL STAGE I AND STAGE II TWISTING, MAINTENANCE & LUBRICATION

MACHINE PART	FREQUENCY	LUBRICANT
Clean all fly and dust. Check all Detectors for correct operation	Each shift	-
Check delivery and winding rollers all yarn guides, pot lids and twizzles on stage II for cracks, deformity etc. Check tape drives for fraying.	Daily	-
Take great care when fitting new tapes. Correct side up. Check spindle direction.	When fitted	-
All gears in head stock and eccentric box	Two months	Shell Alvana R2
Ball bearings in head stock etc main drive shaft bearings delivery cylinder bearings Bearings in eccentric box tension jockey.	Quarterly	Shell Alvana R2
Strip the machine. Thoroughly check and clean. Wash pots on Stage II with lukewarm soap and water.	Quarterly	-
Grease motor bearings and check	Half yearly	Shell Alvana R2
Tension jockeys on tape drive	Yearly	Shell Alvana R2
Spindles washout and oil	Yearly	Tellus Cil 27
Turbo coupling. Drain and refill. Follow manual instructions carefully	2 years	Shell Tegula 27

METTLER CONING MAINTENANCE & LUBRICATION

MACHINE PART	FREQUENCY	LUBRICANT
Clean away all fly and dust	Every Shift	-
Check winding drums for correct starting	Daily	-
Check yarn stop motion yarn guides	Daily	-
Check winding drums for stopping	Daily	-
Check for X winding	Daily	-
Check tensions	Daily	-
Check for ribboning	Weekly	-
Lubricate variable speed pulley	Weekly	Shell alvana R2
Grease all bearings	Monthly	Shell alvana R2
Grease all slide bearings	Monthly	Shell alvana R2
Oil all gears etc	Monthly	Vitrea oil 37

HIRSCHBURGER CLIP CONING MAINTENANCE AND LUBRICATION

MACHINE PART	FREQUENCY	LUBRICANT
Clean away all fly and dust	Every Shift	-
Check alignment of cone to drum tip - 2 mm from drum	Daily	-
Check yarn stop motions	Daily	-
Check yarn guides and drums	Daily	-
Check cones for X winding	Daily	-
Check cones for bearings	Daily	-
Check engagement of winding head	Daily	-
Grease all bearings	Half yearly	Shell Alvana R2
Check V-Belts for wear and tension	Monthly	-
Clean and lightly lubricate cone holders	Monthly	Shell Alvana R2

Remember here perfect cones are required at all times, to prevent spiral yarn and excessive waste.

REELING MAINTENANCE & LUBRICATION

MACHINE PART	FREQUENCY	LUBRICANT
Clean all Fly and dust	Every Shift	-
Check all yarn guides	Daily	-
Check reel dia. At least at 4 different points	Weekly	-
Check stop motion, by checking length delivered	Monthly	-
Check drive for tension and wear	Monthly	-
Lightly grease all moving parts	Quarterly	Shell Alvana R2

APPENDIX IX

PROCESS PARAMETERS & SETTINGS

HIGH TECH YARNS

The following process sheets, give in detail, process parameters and International norms for various yarns:

Where the same yarn has been produced with different fibre specifications, or alternative process parameters, all are shown. Others give parameters and fibre specifications for yarns not yet produced. These can be utilised in product development.

Dependent as the KF is, on locally available raw materials, I have no doubt that parameters will require adjustment from time to time. As a guide, adjust spinning draft downwards, as fibre length decreases.

As a general comment spinning drafts on 100% wool should be kept to 16 and below, for the types of wool tops normally available. Despite machine makers claims for high drafts, it is a fact of life that unless you have fibre length, high drafts will contribute to uneven yarn. I further advise that in the lighter count range under spinning not over spinning should be the norm.

Local Tops tend to be fairly high in % fatty matter. Your FM6 high speed Finisher, does not like high fatty content. Makers claim maximum is 0'9% TOTAL FATTY CONTENT. Take great care before exceeding 1%. A good level of relative humidity is essential for producing a good roving on KF preparatory machinery 65 to 70% RH. A good roving is an essential pre-requisite for a good yarn. In actual practice you may find that a better spin is obtained at around 50% relative humidity (spinning area - not drawing area) than at the normal 65% relative humidity. Although more fly waste must be anticipated at the lower relative humidity. It is possible to have a number of counts bunched together and produced from the same gram weight of roving. This obviously simplifies preparation and gives some flexibility in spinning, if a different count is required urgently by the market.

A suggested grouping is shown below*

Bear in mind however that:-

a) The fibre parameters will have to be such that adequate spinnability is available to the higher range of counts whereas one might normally utilize a cheaper top in the lower count range. This system could therefore be prohibitive on cost, i.e. For 1/42 Nm Weaving Yarn: Where a good even level and strong yarn is called for I would recommend a 21 Micron 65 mm Top, but for 2/26 hosiery for example, I would reccmmend anything from 22 micron to 24 micron with a mean fibre length of 60 mm plus.

b) FM6 Finisher Efficiency could become critical. Should heavier counts pre-dominate eg. a roving gram weight of 0'6 grams will produce 101 Kilo's per hour whilst a roving gram of 0'45 grams will produce 75 Kilo's per hour

ROVING WEIGHTS IN GRAMS PT	COUNT	DRAFT	COUNT	DRAFT	COUNT	DRAFT	COUNT	DRAFT	COUNT	DRAFT	COUNT	DRAFT
0'33	1/52	17'8	1/48	15'65	1/44	14'53	-	-	-	-	-	-
0'45	1/42	18'9	1/40	18'0	1/36	16'24	1/32	14'42	1/30	13'51	1/26	11'7
1'00	1/16	16'1	-	-	-	-	-	-	-	-	-	-

HIGH TEC YARNS - PROCESSING PARAMETERS

STYLE HAND KNITTING | QUALITY 100% WOOL | FIBRE ORIGIN

BLEND DETAILS | DEN/MIC 27 | MEAN LENGTH 70 mm

COUNT 4/16 nm | SINGLES TWIST 320 Z | TWOFOLD TWIST 150S | ADDITIVE NOPCO LV 40

REMARKS TWIST FACTOR SINGLES 80 FOURFOLD 75	GRMS INPUT	DOUBLINGS	DRAFT	GRMS OUTPUT	COUNT	RATCH	CONDENSOR	APRON GAP	APRON PRESSURE WEIGHT	U% STANDARD	THICK PLACES STD	THIN PLACES STD	NEPS STD	TRAVELLER	DELIVERY MTS	CLEARER SETTING	
DE FELTER																	
AUTO BLENDER																	
AUTO LEVELLER	22	8	8	22		40				2'2					100		
INTERSECTOR 1	22	5	7'0	15'75		35				2'3					100		
INTERSECTOR 2	15'75	4	6'3	10		35				2'4					100		
FM6 FINISHER	10	1	10'0	1'0			GREY	0'75	7/8	3'6					120		
SPINNING	1'0	1	16'1		1/16			GRN		11'6	15	30	11	18	21		
AUTOCONER					4/16										800	3/7/5	
HAMEL					4/16										35		
VOLKMAN					4/16										35		
CLIP CONING					1/16										500	3/7/5	

SPECIAL INSTRUCTIONS:- FOR THREEPLY USE FOLDING TWIST 190S. DO NOT STEAM.

KNITTING FACILITY - HIGH TEC YARNS - PROCESS STANDARDS

STYLE HOSIERY | QUALITY 100% WOOL | FIBRE ORIGIN } 62 mm

BLEND DETAILS: 70% 24 70% } 23'5 | MEAN LENGTH 65 mm 457 mm }

COUNT 2/26 NM | SINGLES TWIST 417Z | TWOFOLD TWIST 180S | ADDITIVE NOPCO LV 40

REMARKS TWIST FACTOR SINGLES 82 TWOFOLD 50	GRMS INPUT	ENDINGS	DRAFT	GRMS OUTPUT	COUNT	RATE	CONDENSER	AFRM GAL	AFRM PRESSURE WEIGHT	U. STANDARD	THICK PLACES STD	THIN PLACES STD	NEPS STD	TRAVELLER	DELIVERY MTS	CLEARER SETTING	
DE FELTER																	
AUTO BLENDER																	
AUTO LEVELLER	20	6	8	20		40				1'94					100		
INTERSECTOR 1	20	4	7'2	11		35				2'3					100		
INTERSECTOR 2	11	3	6'2	5'3		35				2'8					100		
FN6 FINISHER	5'3	1	10'0	0'53			ORG	0'5	6	4'6					120		
SPINNING	0'53	1	13'9		1/26			BLK		12'8	26	65	12	21	20		
AUTOCONER					1/26										800	3/7/5	
PANEL					2/26										35		
VOLKMAN					2/26										35		
CLH CONING					1/26										5 00	3/7/5	

SPECIAL INSTRUCTIONS:- DO NOT STEAM

KNITTING FACILITY - HIGH TEC YARNS - PROCESS STANDARDS

STYLE HOSIERY | QUALITY 100% WOOL | FIBRE ORIGIN

BLEND DETAILS | DEN/MIC 24 | MEAN LENGTH 67 mm

COUNT 2/26 nm | SINGLES TWIST 427 Z | TWOFOLD TWIST 160S | ADDITIVE NOPCO LV 40

REMARKS TWIST FACTOR SINGLES 84 TWOFOLD 50	GRAMS INPUT	DOUBLINGS	DRAFT	GRAMS OUTPUT	COUNT	RATCH	CONDENSOR	APRON GAP	APRON PRESSURE WEIGHT	U% STANDARD	THICK PLACES STD	THIN PLACES STD	NEPS STD	TRAVELLER	DELIVERY MTS	CLEARER SETTING	
DE FELTER																	
AUTO BLENDER																	
AUTO LEVELLER	20	8	8	20		40				1'94					100		
INTERSECTOR 1	20	4	7'2	11		35				2'3					100		
INTERSECTOR 2	11	5	6'2	5'3		35				2'8					100		
FM6 FINISHER	5'3	1	10'0	0'53			ORG	0'75	6	4'6					120		
SPINNER	0'53	1	13'9		1/26			BLK		13'2	26	65	12	21	20		
AUTOCONER					1/26										800	3/7/5	
HAMEL					2/26										35		
VOLKMAN					2/26										35		
CLIT CONING					1/26										500	3/7/5	

SPECIAL INSTRUCTIONS:- DO NOT STEAM

KNITTING FACILITY - HIGH TEC YARNS - PROCESS STANDARDS

STYLE HOSIERY | QUALITY 100% WOOL | FIBRE ORIGIN PUNJAB WOOLCOMBERS WELLMAN

BLEND DETAILS PUNJAB WOOLCOMBERS 67% / WELLMAN 33% | DEN/MIC 22'9 / 22'5 } 22'7 | MEAN LENGTH 63 / 57 } 61 mm

COUNT 2/26 nm | SINGLES TWIST 417 Z | TWOFOLD TWIST 160S | ADDITIVE NOPCO LV 40

REMARKS TWIST FACTOR SINGLES 82 TWOFOLD 50	GRAMS INPUT	DOUBLINGS	DRAFT	GRAMS OUTPUT	COUNT	RATCH	CONDENSOR	APRON GAP	APRON PRESSURE WEIGHT	% STANDARD	THICK PLACES STD	THIN PLACES STD	NEPS STD	TRAVELLER	DELIVERY MTS	CLEARER SETTING	
DE FELTER																	
AUTO BLENDER																	
AUTO LEVELLER	20	8	8	20		35				1'8					100		
INTERSECTOR 1	20	4	7'2	11		30				2'0					100		
INTERSECTOR 2	11	3	6'2	5'3		30				2'2					100		
FM6 FINISHER	5'3	1	10'0	0'53			ORG	0'5	5	4'1					120		
SPINNING	0'53	1	13'9		1/26			BLK		12'5	26	65	12	21	20		
AUTOCONER					1/26										800	3/7/5	
HAMEL					2/26										35		
VOLKMAN					2/26										35		
CLIF CONING					1/26										500	3/7/5	

SPECIAL INSTRUCTIONS:- DO NOT AM

KNITTING FACILITY - HIGH TEC YARNS - PROCESS STANDARD

STYLE HOSIERY | QUALITY LAMBSWOOL 100% | FIBRE ORIGIN | 59'9 mm

BLEND DETAILS | DEN/MIC 30% 19, 70% 22 } 21 | MEAN LENGTH 30% 55 mm, 70% 62 mm

COUNT 2/26 nm | SINGLES TWIST 417 Z | TWOFOLD TWIST 1803 | ADDITIVE NOPCO LV 40

REMARKS TWIST FACTOR SINGLES 82 TWOFOLD 50	GRAMS INPUT	DOUBLINGS	DRAFT	GRAMS OUTPUT	COUNT	RATCH	CONDENSOR	APRON GAP	APRON PRESSURE WEIGHT	U% STANDARD	THICK PLACES STD	THIN PLACES STD	NEPS STD	TRAVELLER	DELIVERY MTS	CLEARER SETTING	
DE FELTER																	
AUTO BLENDER																	
AUTO LEVELLER	20	8	8	20		35				1'7					100		
INTERSECTOR 1	20	4	7'2	11		30				1'9					100		
INTERSECTOR 2	11	3	6'2	5'3		30				2'0					100		
FE6 FINISHER	5'3	1	10'0	0'53			ORG	0'5	5	3'8					120		
SPINNING	0'53	1	13'9		1/26			BLK		11'5	26	65	12	21	20		
AUTOCONER					1/26										700	3/7/5	
HAMEL					2/26										35		
VOLKMAN					2/26										35		
CLIP CONING					1/26										500	3/7/5	

SPECIAL INSTRUCTIONS:- DO NOT STEAM

KNITTING FACILITY - HIGH TEC YARNS - PROCESS STANDARDS

STYLE HOSIERY | QUALITY 100% WOOL | FIBRE ORIGIN PUNJAB WOOLCOMBERS 75% WOOLCOMBERS INDIA 75%

BLEND DETAILS EXPERIMENTAL BLEND FOR QUALITY & PRICE | DEN/MIC 22'9 25% / 22'5 75% } 22'6 | MEAN LENGTH 65 mm 25% / 55 mm 75% } 57'5 mm

COUNT 2/30 nm | SINGLES TWIST 448 Z | TWOFOLD TWIST 193 S | ADDITIVE DUROSLIP 1410

REMARKS TWIST FACTORS SINGLES 82 TWOFOLD 50	GRAMS INPUT	DOUBLINGS	DRAFT	GRAMS OUTPUT	COUNT	RATCH	CONDENSOR	APRON GAP	APRON PRESSURE WEIGHT	U% STANDARD	THICK PLACES STD	THIN PLACES STD	NEPS STD	TRAVELLER	DELIVERY MTS	CLEARER SETTING	
DE FELTER																	
AUTO BLENDER																	
AUTO LEVELLER	20	8	8	20		35				1'8					100		
INTERSECTOR 1	20	4	7'2	11		30				2'0					100		
INTERSECTOR 2	11	5	6'2	5'3		30				2'2					100		
FM6 FINISHER	5'3	1	10'0	0'53			ORG	0'5	5	4'1					140		
SPINNING	0'53	1	16'0		1/30			BLK		13'4	31	93	13	22	19		
AUTOCONER					1/30										700	3/7/5	
HANEL					2/30										35		
VOLKMAN					2/30										35		
CLIP CONING					1/30										500	3/7/5	

SPECIAL INSTRUCTIONS:- LEND AS FOLLOWS 2 TOPS PUNJAB WOOLCOMBERS
6 TOPS WOOLCOMBERS INDIA

KNITTING FACILITY - HIGH TEC YARNS - PROCESS STANDARDS

STYLE HOSIERY | QUALITY 100% WOOL | FIBRE ORIGIN WELLMAN

BLEND DETAILS EXPERIMENTAL BLEND WITH 100 55 mm 22'5 m | DEN/MIC 22'5 | MEAN LENGTH 55 mm

COUNT 2/30 nm | SINGLES TWIST 448 Z | TWOFOLD TWIST 193 S | ADDITIVE NOPCO LV 40 OR DUROSLID 1410 CROSSLUSE CL

REMARKS TWIST FACTOR SINGLES 82 TWOFOLD 50	GRMS INPUT	DOUBLINGS	DRAFT	GRMS OUTPUT	COUNT	RATCH	CONDENSOR	APRON GAP	APRON PRESSURE WEIGHT	U. STANDARD	THICK PLACES STD	THIN PLACES STD	NEPS STD	TRAVELLER	DELIVERY MTS	CLEARER SETTING	
DE. FELTER																	
AUTO BLENDER																	
AUTO LEVELLER	20	8	8	20		30				1'8					100		
INTERSECTOR 1	20	4	7'2	11		25				2'0					100		
INTERSECTOR 2	11	3	6'2	5'3		25				2'2					100		
ERG FINISHER	5'3	1	10'0	0'53			ORG	0'5	3/4	4'1					140		
SPINNING	0'53	1	16'0		1/30			BLK		13/4					19		
AUTOCONER					1/30										700	3/7/5	
HANK					2/30										35		
WOLLMAN					2/30										35		
CLIF CONING					1/30										500	3/7/5	

SPECIAL INSTRUCTIONS:-

KNITTING FACILITY - HIGH TEC YARNS - PROCESS STANDARDS

STYLE HOSIERY | QUALITY 100% WOOL | FIBRE ORIGIN PUNJAB WOOLCOMBERS / WELLMAN

BLEND DETAILS: PUNJAB WOOLCOMBERS 67% / WELLMAN 33% | DEN/MIC 22'9 / 22'5 } 22'7 | MEAN LENGTH 63 mm / 57 mm } 61 mm

COUNT 2/30 nm | SINGLES TWIST 448 Z | TWOFOLD TWIST 193 S | ADDITIVE NOPCO LV 40

REMARKS TWIST FACTOR SINGLES 82 TWOFOLD 50	GRMS INPUT	DOUBLINGS	DRAFT	GRMS OUTPUT	COUNT	RATCH	CONDENSOR	APRON GAP	APRON PRESSURE WEIGHT	U% STANDARD	THICK PLACES STD	THIN PLACES STD	NEPS STD	TRAVELLER	DELIVERY M/S	CLEARER SETTING	- - -
DE FELTER																	
AUTO BLENDER																	
AUTO LEVELLER	20	8	8	20		35				1'8					100		
INTERSECTOR 1	20	4	7'2	11		30				2'0					100		
INTERSECTOR 2	11	3	6'2	5'3		30				2'2					100		
RMG FINISHER	5'3	1	10'0	0'53			ORG	0'5	5	4'1					120		
SPINNING	0'53	1	16'0		1/30			BLK		13'4	31	93	13	22	19		
AUTOCONER					1/30										700	3/7/5	
HAMEL					2/30										35		
VOLKMAN					2/30										35		
CLIP CONING					1/30											3/7/5	

SPECIAL INSTRUCTIONS:- DO NOT STEAM

KNITTING FACILITY - HIGH TEC YARNS - PROCESS STANDARDS

STYLE HOSIERY | QUALITY 100% WOOL | FIBRE ORIGIN WOOLCOMBERS / WELLMAN

BLEND DETAILS 50% WELLMAN, 50% WOOLCOMBERS | DEN/MIC 23'1, 22'4 } 22'7 | MEAN LENGTH 65, 55 } 60 mm

COUNT 2/30 nm | SINGLES TWIST 448 Z | TWOFOLD TWIST 193'5 S | ADDITIVE NOPCO LV 40

REMARKS TWIST FACTOR SINGLES 82 TWOFOLD 50	GRAMS INPUT	DOUBLINGS	DRAFT	GRAMS OUTPUT	COUNT	RATCH	CONDENSOR	APRON GAP	APRON PRESSURE WEIGHT	U% STANDARD	THICK PLACES STD	THIN PLACES STD	NEPS STD	TRAVELLER	DELIVERY M/S	CLEARER SETTING	
DE FELTER																	
AUTO BLENDER																	
AUTO LEVELLER	20	8	8'0	20		35				1'8					100		
INTERSECTOR 1	20	4	8'0	10		30				2'0					100		
INTERSECTOR 2	10	4	7'5	5'3		30				2'2					100		
FMo FINISHER	5'3	1	10'0	0'53			ORG	0'5	5	4'1					120		
SPINNING	0'53	1	16'0		1/30			BLK		13'4	31	93	13	22	19		
AUTOCONER					1/30										700	3/7/5	
HAMEL					2/30										55		
VOLKMAN					2/30										35		
CLIP CONING					1/30										500	3/7/5	

SPECIAL INSTRUCTIONS:- DO NOT STEAM

SPECIAL INSTRUCTIONS:- STEAM SINGLES @ 85°C DOUBLE CYCLE
STEAM TWOPLY @ 85°C DOUBLE CYCLE

MADE BY TWISTING
1/36 900 Z TWIST)
1/36 900 S TWIST) 2/36 S TWIST 900 TPM

IN ORDER TO AVOID SERIOUS MIXING IT IS ADVISABLE TO SPIN ONE COMPONENT END WITH FALSE TINT. DO NOT USE INFERIOR TOP. UNEVEN YARN WILL SHOW IN FINISHED PRODUCT.

KNITTING FACILITY - HIGH TEC YARNS - PROCESS STANDARDS

STYLE CREIE | QUALITY 100% WOOL | FIBRE ORIGIN

BLEND DETAILS | DEN/MIC 22 mic | MEAN LENGTH 65 mm

COUNT 2/36 nm | SINGLES TWIST 1/36 900 S 1/36 900 Z | TWOFOLD TWIST 900 S | ADDITIVE NOPCO LV 40

REMARKS TWIST FACTORS SINGLES 150 TWOFOLD 212	GEARS INPUT	BOBBINS	DRAFT	GEARS OUTPUT	COUNT	RATCH	CONDENSOR	APRON GAP	APRON PRESSURE WEIGHT	U STANDARD	TRICE PLACES STD	THIN PLACES STD	NEPS STD	TRAVELLER	DELIVERY MTS	CLEARER SETTING	
DE FELTER																	
AUTO BLENDER																	
AUTO LEVELLER	20	8	7'6	21		35				1'8					100		
INTERSECTOR 1	21	4	7'0	12		30				2'0					100		
INTERSECTOR 2	12	3	6'5	5'5		30				2'2					100		
FM6 FINISHER	5'5	1	12'8	0'43			ORG	0'5	4	4'5					120		
SPINNING	0'43	1	16'0		1/36			BLK		14'5	40	115	15	22	17'3		
AUTOCONER					1/36										700	3/7/5	
HAMEL					2/36										35		
VOLKMAN					2/36										35		
CLIP CONING					1/36										500	3/7/5	

KNITTING FACILITY - HIGH TEC YARNS - PROCESS STANDARDS

STYLE HOSIERY QUALITY 100, WOOL FIBRE ORIGIN

BLEND DETAILS BLEND TO OBTAIN DEN/MIC 22'5 AV MEAN LENGTH 62/63 mm

COUNT 2/36 nm SINGLES TWIST 492 Z TWOFOLD TWIST 212 S ADDITIVE NOPCP LV 40

REMARKS SINGLES TWIST FACTOR 82 TWOFOLD TWIST FACTOR 50	GRAMS INPUT	DOUBLINGS	DRAFT	GRAMS OUTPUT	COUNT	RATCH	CONDENSOR	APRON GAP	APRON PRESSURE WEIGHT	U% STANDARD	THICK PLACES STD	THIN PLACES STD	NEPS STD	TRAVELLER	DELIVERY MTS	CLEARER SETTING	
DE FELTER																	
AUTO BLENDER																	
AUTO LEVELLER	20	8	7'6	21		35				1'8					100		
INTERSECTOR 1	21	4	7'0	12		30				2'0					100		
INTERSECTOR 2	12	3	6'5	5'5		30				2'2					100		
FM6 FINISHER	5'5	1	12'8	0'43			ORG	0'5	4	4'5					120		
SPINNING	0'43	1	16'0		1/36			BLK		14'6	40	115	15	23	17'3		
AUTOCONER					1/36										700	3/7/5	
HAMEL					2/36										35		
VOLKMAN					2/36										35		
CLIP CONING					1/36										500	3/7/5	

SPECIAL INSTRUCTIONS:- DO NOT STEAM

KNITTING FACILITY - HIGH TEC YARNS - PROCESS STANDARDS

STYLE HOSIERY | QUALITY 100% WOOL | FIBRE ORIGIN

BLEND DETAILS | DEN/MIC } 22 | MEAN LENGTH } 65 mm

COUNT 2/40 nm | SINGLES TWIST 518 Z | TWOFOLD TWIST 223 S | ADDITIVE NOPCO LV 40

REMARKS TWIST FACTOR SINGLES 82 TWOFOLD 50	GRAMS INPUT	DOUBLINGS	DRAFT	GRAMS OUTPUT	COUNT	RATCH	CONDENSOR	APRON GAP	APRON PRESSURE WEIGHT	U% STANDARD	THICK PLACES STD	THIN PLACES STD	NEPS STD	TRAVELLER	DELIVERY MTS	CLEARER SETTING	- [illegible] -
DE FELTER																	
AUTO BLENDER																	
AUTO LEVELLER	20	8	7'6	21		35				1'8					100		
INTERSECTOR 1	21	4	7'0	12		30				2'0					100		
INTERSECTOR 2	12	3	6'8	5'3		30				2'2					100		
FM6 FINISHER	5'3	1	13'2	0'4			ORG	0'5	3/4	4'6					120		
SPINNING	0'4	1	16'0		1/40			BLK		14'9	45	140	14	24	16'4		
AUTOCONER					1/40										700	3/7/5	
HANEL					2/40										35		
VOLKMAN					2/40										35		
CLIP CONING					1/40										500	3/7/5	

SPECIAL INSTRUCTIONS:- DO NOT STEAM

KNITTING FACILITY - HIGH TEC YARNS - PROCESS STANDAID

STYLE WEAVING | QUALITY 100% WOOL | FIBRE ORIGIN

BLEND DETAILS | DEN/MIC 20'5 | MEAN LENGTH 65 mm

COUNT 1/42 nm | SINGLES TWIST 550 Z | TWOFOLD TWIST | ADDITIVE NOPCO LV 40

REMARKS TWIST FACTOR 85	GRMS INPUT	DOUBLINGS	DRAFT	GRMS OUTPUT	COUNT	RATCH	CONDENSOR	APRON GAP	APRON PRESSURE WEIGHT	U% STANDARD	THICK PLACES STD	THIN PLACES STD	NEPS STD	TRAVELLER	DELIVERY MTS	CLEARER SETTING	
DE FELTER																	
AUTO BLENDER																	
AUTO LEVELLER	20	8	7'6	21		35				1'55					100		
INTERSECTOR 1	21	4	7'0	12		30				1'8					100		
INTERSECTOR 2	12	3	6'8	5'3		30				1'9					100		
F46 FINISHER	5'3	1	15'1	0'35			CRG	0'5	2/3	4'5					120		
SPINNING	0'35	1	15'2		1/42			BLK		14'2	49	170	14	24/25	15'45		
AUTOCONER					1/42										700	3/7/5	
RAGEI																	
VOLKMAN																	
CLIP CONING																	

SPECIAL INSTRUCTIONS:- STEAM @ 85°C DOUBLE CYCLE

KNITTING FACILITY - HIGH TEC YARNS - PROCESS STANDARDS

STYLE HOSIERY | QUALITY 100% WOOL | FIBRE ORIGIN

BLEND DETAILS | DEN/MIC 21'5 | MEAN LENGTH 65 mm

COUNT 2/44 nm | SINGLES TWIST 541 Z | TWOFOLD TWIST 234 S | ADDITIVE NOPCO LV 40

REMARKS TWIST FACTOR SINGLES 82 TWOFOLD 50	GRAMS INPUT	DOUBLINGS	DRAFT	GRAMS OUTPUT	COUNT	RATCH	CONDENSOR	APRON GAP	APRON PRESSURE WEIGHT	U. STANDARD	THICK PLACES STD	THIN PLACES STD	NEPS STD	TRAVELLER	DELIVERY MTS	CLEARER SETTING	
DE FELTER																	
AUTO BLENDER																	
AUTO LEVELLER	20	8	7'6	21		35				1'8					100		
INTERSECTOR 1	21	4	7'0	12		30				2'0					100		
INTERSECTOR 2	12	3	6'8	5'3		30				2'2					100		
FM6 FINISHER	5'3	1	15'1	0'35			ORG	0'5	2/3	4'8					120		
SPINNING	0'35	1	16'0		1/44			BLK		15'6	49	170	14	25	15'7		
AUTOCONER					1/44										700	3/7/5	
HAMEL					2/44										55		
VOLKMAN					1/44										55		
CLII CONING					1/44										500	3/7/5	

SPECIAL INSTRUCTIONS:- DO NOT STEAM

SPECIAL INSTRUCTIONS:-

MAKE 2/44 nm WITH 320 TPM (Z) REVERSE TWIST
MAKE 2/1/44 nm WITH 540 TPM S
STEAM 2/1/44 nm @ 85°C DOUBLE CYCLE

KNITTING FACILITY - HIGH TEC YARNS - PROCESS STANDARDS

STYLE FRESCO | QUALITY 100% WOOL | FIBRE ORIGIN

BLEND DETAILS | DEN/MIC 21'5 MIC | MEAN LENGTH 65 mm

COUNT 2/2/44 nm | SINGLES TWIST 540 Z | TWO FOLD 1st TWIST 2/44 320 Z, 2nd TWIST 3/44 540 Z | ADDITIVE NOPCO LV 40

REMARKS TWIST FACTOR SINGLES 82 TWOPLY THREEPLY } TPM & PEC	GRAMS INPUT	DOUBLINGS	DRAFT	GRAMS OUTPUT	COUNT	RATCH	CONDENSOR	APRON GAP	APRON PRESSURE WEIGHT	% STANDARD	THICK PLACES STD	THIN PLACES STD	NEPS STD	TRAVELLER	DELIVERY MTS	CLEARER SETTING	
DE FELTER																	
AUTO BLENDER																	
AUTO LEVELLER	20	6	7'6	21		35				1'8					100		
INTERSECTOR 1	21	4	7'0	12		30				2'0					100		
INTERSECTOR 2	12	3	6'6	5'3		30				2'2					100		
FM6 FINISHER	5'3	1	15'1	0'35			ORG	0'5	2/3	4'8					120		
SPINNING	0'35	1	16'0		1/44			BLK		15'6	49	170	14	25	15'7		
AUTOCONER					1/44										700	3/7/5	
HAMEL					2/44										35		
VOLKMAN					3/44										35		
CLIP CONING					1/44										500	3/7/5	

KNITTING FACILITY - HIGH TEC YARNS - PROCESS STANDARDS

STYLE HOSIERY | QUALITY 100% WOOL | FIBRE ORIGIN

BLEND DETAILS | DEN/MIC } 20 | MEAN LENGTH } 65 mm

COUNT 2/48 nm | SINGLES TWIST 567 Z | TWOFOLD TWIST 244 S | ADDITIVE NOPCO LV 40

REMARKS TWIST FACTOR SINGLES 82 TWOFOLD 50	GRAMS INPUT	DOUBLINGS	DRAFT	GRAMS OUTPUT	COUNT	RATCH	CONDENSOR	APRON GAP	APRON PRESSURE WEIGHT	U% STANDARD	THICK PLACES STD	THIN PLACES STD	NEPS STD	TRAVELLER	DELIVERY MTS	CLEARER SETTING	
DE FELTER																	
AUTO BLENDER																	
AUTO LEVELLER	20	8	7'6	21		35				1'55					100		
INTERSECTOR 1	21	4	7'0	12		30				1'8					100		
INTERSECTOR 2	12	3	6'8	5'3		30				1'9					100		
EM6 FINISHER	5'3	1	15'1	0'35			ORG	0'5	2/3	4'5					120		
SPINNING	0'35	1	17'5		1/48			WHITE		17'5	57	200	15	26	15		
AUTOCONER					1/48										700	3/7/5	
RAMEL					2/48										35		
VOLKMAN					2/48										35		
CLIP CONING					1/48										500	3/7/5	

SPECIAL INSTRUCTIONS:- DO NOT STEAM

KNITTING FACILITY - HIGH TEC YARNS - PROCESS STANDARD

STLYE WEAVING (LUDHIANA) QUALITY 100% WOOL FIBRE ORIGIN

BLEND DETAILS DEN/MIC }20 MEAN LENGTH } 65 mm

COUNT 2/46 SINGLES TWIST 567 Z TWOFOLD TWIST 480 S ADDITIVE NOPCO LV 40

REMARKS TWIST FACTOR SINGLES 82 TWOFOLD 98	GRMS INPUT	DOUBLINGS	DRAFT	GRMS OUTPUT	COUNT	RATCH	CONDENSOR	APRON GAP	APRON PRESSURE WEIGHT	U. STANDARD	THICK PLACES STD	THIN PLACES STD	NEPS STD	TRAVELLER	DELIVERY MTS	CLEARER SETTING	
DE FELTER																	
AUTO BLENDER																	
AUTO LEVELLER	20	8	7'6	21		35				1'55					100		
INTERSECTOR 1	21	4	7'0	12		30				1'8					100		
INTERSECTOR 2	12	3	6'8	5'3		30				1'9					100		
RMS FINISHER	5'3	1	15'1	0'35			ORG	0'5	2/3	4'5					120		
SPINNING	0'35	1	17'5		1/46			BLK		17'5	57	200	15	26	15		
AUTOCONER					1/48										700	3/7/85	
HAMEL					2/48										35		
VOLKMAN					2/48										35		
CLIP CONING					1/48										500	3/7/85	

SPECIAL INSTRUCTIONS:- STEAM SINGLES @ 85°C SINGLE CYCLE
STEAM TWOPLY @ 85°C DOUBLE CYCLE

KNITTING FACILITY - HIGH TEC YARNS - PROCESS STANDARDS

STYLE WEAVING (INTERNATIONAL) QUALITY 100% WOOL FIBRE ORIGIN

BLEND DETAILS DEN/MIC 20 MEAN LENGTH 65 mm

COUNT 2/48 nm SINGLES TWIST 588 Z TWOFOLD TWIST 596 ADDITIVE NOPCO LV 40

REMARKS TWIST FACTOR SINGLES 85 TWOFOLD 122	GRMS INPUT	DOUBLINGS	DRAFT	GRMS OUTPUT	COUNT	RATCH	CONDENSOR	APRON GAP	APRON PRESSURE WEIGHT	US STANDARD	THICK PLACES STD	THIN PLACES STD	NEPS STD	TRAVELLER	DELIVERY M/S	CLEARER SETTING	
DE FELTER																	
AUTO BLENDER																	
AUTO LEVELLER	20	8	7'6	21		35				1'55					100		
INTERSECTOR 1	21	4	7'0	12		30				1'8					100		
INTERSECTOR 2	12	3	6'8	5'3		30				1'9					100		
FM6 FINISHER	5'3	1	15'1	0'35			ORG	0'5	2/3	4'5					120		
SPINNING	0'35	1	17'5		1/48			BLK		17'5	57	200	15	26	15		
AUTOCONER					1/48										700	3/7/5	
HAMEL					2/48										55		
VOLKMAN					2/48										35		
CLIP CONING					1/48										500	3/7/5	

SPECIAL INSTRUCTION:- STEAM SINGLES @ 85°C SINGLE CYCLE
STEAM TWOFLY @ 85°C DOUBLE CYCLE

KNITTING FACILITY - HIGH TEC YARNS - PROCESS STANDARD

STYLE WEAVING (MARL & TWIST YARNS) QUALITY 100% WOOL FIBRE ORIGIN

BLEND DETAILS DEN/MIC 20 MEAN LENGTH 65 mm

COUNT 2/48 nm SINGLES TWIST 588 Z TWOFOLD TWIST 806 ADDITIVE NOPCP LV 40

REMARKS TWIST FACTOR SINGLES 85 TWOFOLD 165	GRAMS INPUT	DOUBLINGS	DRAFT	GRAMS OUTPUT	COUNT	RATCH	CONDENSOR	APRON GAP	APRON PRESSURE WEIGHT	U% STANDARD	THICK PLACES STD	THIN PLACES STD	NEPS STD	TRAVELLER	DELIVERY M/S	CLEARER SETTING	
DE FELTER																	
AUTO BLENDER																	
AUTO LEVELLER	20	8	7'6	21		35				1'55					100		
INTERSECTOR 1	21	4	7'0	12		30				1'8					100		
INTERSECTOR 2	12	3	6'8	5'3		30				1'9					100		
E36 FINISHER	5'3	1	15'1	0'35			ORG	0'5	2/3	4'5					120		
SPINNING	0'35	1	17'5		1/48			BLK		17'5	57	200	15	26	15		
AUTOCONER					1/48										700	3/7/5	
HANEL					2/48										35		
VOLKMAN					2/48										35		
CLIP CONING					1/48										500	3/7/5	

SPECIAL INSTRUCTIONS:- STEAM SINGLES @ 85°C SINGLE CYCLE
STEAM TWOFLY @ 85°C DOUBLE CYCLE

KNITTING FACILITY - HIGH TEC YARNS - PROCESS STANDARDS

STYLE HOSIERY (MILITARY) QUALITY WOOL/NYLON 80/20 HERCOSET FIBRE ORIGIN KNITWEAR FACILITY

BLEND DETAILS 80% HERCOSET WOOL 20% NYLON DEN/MIC 24 m 3 DEN 22'5 m MEAN LENGTH 60 mm 65/100 mm VC

COUNT 2/26 NM SINGLES TWIST 417 Z TWOFOLD TWIST 180 S ADDITIVE NOPCO LV 40

REMARKS TWIST FACTOR SINGLES 82 TWOFOLD 50	GRAMS INPUT	DOUBLINGS	DRAFT	GRAMS OUTPUT	COUNT	RATCH	CONDENSOR	APRON GAP	APRON PRESSURE WEIGHT	% STANDARD	THICK PLACES STD	THIN PLACES STD	NEPS STD	TRAVELLER	DELIVERY MTS	CLEARER SETTING	
DE FELTER																	
AUTO BLENDER				20		45									100		
AUTO LEVELLER	20	8	8	20		45				1'7					100		
INTERSECTOR 1	20	4	7'2	11		40				1'9					100		
INTERSECTOR 2	11	3	6'2	5'3		40				2'0					100		
FM6 FINISHER	5'3	1	10'0	0'53			GRY	0'75	7/8	3'8					120		
SPINNING	0'53	1	13'9		1/26			BLK		11'6	22	58	10	21	20		
AUTOCONER					1/26										1000	3/7/5	
HANEL					2/26										35		
VOLKMAN					2/26										35		
CLIP CONING					1/26										500	3/7/5	

SPECIAL INSTRUCTIONS:- DO NOT STEAM

KNITTING FACILITY - HIGH TEC YARNS - PROCESS STANDARDS

STLYE HOSIERY | QUALITY WOOL/ACRYLIC | FIBRE ORIGIN

BLEND DETAILS 80% ACRYLIC REGULAR, 20% WOOL | DEN/MIC 3 DEN / 22'5 m } 17 m | MEAN LENGTH 76/120, 55 mm

COUNT 2/26 nm | SINGLES TWIST 417 Z | TWOFOLD TWIST 180 S | ADDITIVE NOPCO LV 40

REMARKS TWIST FACTOR SINGLES 82 TWOFOLD 50 BLEND TO 80/20% A/W ON BLENDER AFTER CHECKING SLIVER WEIGHTS DELIVERY 20 GRS MT	GRAMS INPUT	DOUBLINGS	DRAFT	GRAMS OUTPUT	COUNT	RATCH	CONDENSOR	APRON GAP	APRON PRESSURE WEIGHT	U% STANDARD	THICK PLACES STD	THIN PLACES STD	NEPS STD	TRAVELLER	DELIVERY MTS	CLEARER SETTING	
DE FELTER																	
AUTO BLENDER				20		45									100		
AUTO LEVELLER	20	8	8	20		45				1'4					100		
INTERSECTOR 1	20	5	8	12'5		40				1'5					100		
INTERSECTOR 2	12'5	4	7'1	7'0		40				1'7					100		
FM6 FINISHER	7'0	1	10'0	0'7			GREY	1'5	9/10	5'5					120		
SPINNING	0'7	1	18'42		1/26			BLUE		11'6	15	42	8	21	23'9		
AUTOCONER					1/26										1000	3/7/5	
HAMEL					2/26										55		
VOLKMAN					2/26										55		
CLIP CONING					1/26										500	3/7/5	

SPECIAL INSTRUCTIONS:- DO NOT STEAM

KNITTING FACILITY - HIGH TEC YARNS - PROCESS STANDARD

STYLE HOSIERY QUALITY WOOL/ACRYLIC FIBRE ORIGIN

BLEND DETAILS 60% ACRYLIC REGULAR, 20% WOOL DEN/MIC 3 DEN, 22'5 m } 17 MEAN LENGTH 76/120, 55

COUNT 2/32 nm SINGLES TWIST 463 Z TWOFOLD TWIST 200 S ADDITIVE ESTECO LV 40

REMARKS TWIST FACTOR SINGLES 82 TWOFOLD 50 BLEND TO 80/20 A/W ON BLENDER AFTER CHECK SLIVER WEIGHTS. DELIVERY 20 GRAMS	GRAMS INPUT	DOUBLINGS	DRAFT	GRAMS OUTPUT	COUNT	RATCH	CONDENSER	APRON GAP	APRON PRESSURE WEIGHT	US STANDARD	TRICK PLACES STD	TRICK PLACES SET	REF ST	TRAVELLER	DELIVERY M/S	CLEARER SETTING	
DE FELTER																	
AUTO BLENDER				20		45											
AUTO LEVELLER	20	8	8	20		45				1'4					100		
INTERSECTOR 1	20	5	8	12'5		40				1'5					100		
INTERSECTOR 2	12'5	4	7'1	7'0		40				1'7					100		
MK6 FINISHER	7'0	1	10'0	0'7			GREY	1'5	9/10	3'5					120		
SPINNING	0'7	1	22'5		1/32			BLUE		12'9	17	47	8	22	21'5		
AUTOCONER					1/32										1000	3/7/5	
HANEL					2/32										35		
VOLKMAN					2/32										35		
CLIP CONING					1/32										500	3/7/5	

SPECIAL INSTRUCTIONS:- DO NOT STEAM

KNITTING FACILITY - HIGH TEC YARNS - PROCESS STANDARDS

STYLE WEAVING SUPERWASH | QUALITY 60% MERCOSET WOOL 40% LOW PILL POLYESTER | FIBRE ORIGIN ? | KNITWEAR FACILITY

BLEND DETAILS BLEND TO 60/40 WOOL/POLYESTER | DEN/MIC 60% 21 m, 40% 3 D } 19'2 m | MEAN LENGTH 65/100 mm

COUNT 2/52 nm | SINGLES TWIST 600 Z | TWOFOLD TWIST 560 S | ADDITIVE NOICO LV 40 0'5% WOOL OIL

REMARKS TWIST FACTOR SINGLES 82 TWIST FACTOR TWOFOLD 110 BLEND WOOL/POLY ON BLENDER TO CORRECT % DELIVERY WT 20 GR MT	GRMS INPUT	DOUBLINGS	DRAFT	GRMS OUTPUT	COUNT	RATCH	CONDENSOR	APRON GAP	APRON PRESSURE WEIGHT	U% STANDARD	THICK PLACES STD	THIN PLACES STD	NEPS STD	TRAVELLER	DELIVERY MTS	CLEARER SETTING	
DE FELTER																	
AUTO BLENDER				20		40									100		
AUTO LEVELLER	20	8	8	20		40				1'5					100		
INTERSECTOR 1	20	4	7	12		35				1'74					100		
INTERSECTOR 2	12	3	6'8	5'3		35				2'75					100		
FM6 FINISHER	5'3	1	13'2	0'4			ORG	0'5	4/5	4'2					120		
SPINNING	0'4	1	21'0		1/52			BLK		15'1	58	210	15	26	16'6		
AUTOCONER					1/52										1000	3/7/5	
HAMEL					2/52										35		
VOLKMAN					2/52										35		
CLIF CONING					1/52										500	3/7/5	

SPECIAL INSTRUCTIONS:- STEAM SINGLES @ 90°C SINGLE CYCLE
STEAM TWOPLY @ 90°C DOUBLE CYCLE

KNITTING FACILITY - HIGH TEC YARNS - PROCESS STANDARDS

STYLE WEAVING | QUALITY POLYESTER WOOL/TREVIRA | FIBRE ORIGIN

BLEND DETAILS 45% WOOL 55% POLYESTER | DEN/MIC 21 m / 3 D } 18'5 m | MEAN LENGTH 62 mm 65/100 mm

COUNT 2/52 | SINGLES TWIST 600 Z | TWOFOLD TWIST 560 S | ADDITIVE NOPCO LV 40

REMARKS TWIST FACTOR SINGLES 82 TWOFOLD 110 BLEND OR BLENDER TO 45/55 W/P DELIVERY 20 GRMS MT	GRAMS INPUT	DOUBLINGS	DRAFT	GRAMS OUTPUT	COUNT	RATCH	CONDENSER	APRON GAP	APRON PRESSURE WEIGHT	U STANDARD	THICK PLACES STD	THIN PLACES STD	NEPS STD	TRAVELLER	DELIVERY MTS	CLEARER SETTING	
DE FELTER																	
AUTO BLENDER				20		40									100		
AUTO LEVELLER	20	8	8	20		40				1'4					100		
INTERSECTOR 1	20	4	7	12		35				1'45					100		
INTERSECTOR 2	12	3	6'8	5'3		35				1'78					100		
RO FINISHER	5'3	1	13'2	0'4			ORG	0'5	4/5	3'9					120		
SPINNING	0'4	1	21'0		1/52			BLK		14'4	56	210	15	26	16'6		
AUTOCONER					1/52										1000	3/7/5	
CAMEL					2/52										35		
VOLKMAN					2/52										35		
CLIF CONING					1/52										500	3/7/5	

SPECIAL INSTRUCTIONS: STEAM SINGLES @ 90°C SINGLE CYCLE
STEAM TWOFLY @ 90°C DOUBLE CYCLE

KNITTING FACILITY - HIGH TECH YARNS - PROCESS STANDARDS

STYLE WEAVING: QUALITY WOOL/POLYESTER 40/55 % FIBRE ORIGIN

BLEND DETAILS 45% WOOL 55% POLYESTER DEN/MIC 23 m / 3 D } 19'42 MEAN LENGTH 62 mm 65/100 vc

COUNT 2/40 nm SINGLES TWIST 500 Z TWOFOLD TWIST 480S ADDITIVE NOICO LV 40

REMARKS TWIST FACTOR SINGLES 80 TWOFOLD 107 BLEND WOOL/POLYESTER ON BLENDER TO 45/55% DELIVERY 20 GMS MT	GRMS INPUT	DOUBLINGS	DRAFT	GRAMS OUTPUT	COUNT	RATCH	CONDENSOR	APRON GAP	APRON PRESSURE WEIGHT	U STANDARD	TEICH FLACES STD	TEIN FLACES STD	NEPS STD	TRAVELLER	DELIVERY MTS	CYLINDER SETTING	
DE FELTER																	
AUTO BLENDER				20		40									100		
AUTO LEVELLER	20	8	8	20		40				1'4					100		
INTERSECTOR 1	20	4	7	12		35				1'45					100		
INTERSECTOR 2	12	3	6'8	5'3		35				1'78					100		
M46 FINISHER	5'3	1	10'0	0'53			GRY	0'5	5/6	3'4					100		
SPINNING	0'53	1	21'2		1/40			BLK		12'6	45	140	14	23	20		
AUTOCONER					1/40										1000	3/7/5	
HANK					2/40										35		
VOLKMAN					2/40										35		
CLIP CONE					1/40										500	3/7/5	

SPECIAL INSTRUCTIONS:- STEAM SINGLES @ 90°C SINGLES CYCLE
STEAM TWOPLY @ 90°C DOUBLES CYCLE

KNITTING FACILITY - HIGH TEC YARNS - PROCESS STANDARDS

STYLE WEAVING | QUALITY WOOL/POLYESTER 45/55% | FIBRE ORIGIN

BLEND DETAILS 45% WOOL, 55% POLYESTER | DEN/MIC 23 m / 3 D } 19'42 | MEAN LENGTH 62 mm 65/100 VC

COUNT 2/40 nm | SINGLES TWIST 500 Z | TWOFOLD TWIST 480 S | ADDITIVE NOPCO LV 40

REMARKS TWIST FACTOR SINGLES 80 TWOFOLD 107 BLEND WOOL/POLYESTER ON BLENDER TO 45/55 DELIVERY 20 GRMS MT	GRAMS INPUT	DOUBLINGS	DRAFT	GRAMS OUTPUT	COUNT	RATCH	CONDENSER	APRON GAP	APRON PRESSURE WEIGHT	L STANDARD	THICK PLACES STD	THIN PLACES STD	NEPS STD	TRAVELLER	DELIVERY MTS	CLEARER SETTING	
DE FELTER																	
AUTO BLENDER				20		40									100		
AUTO LEVELLER	20	8	8	20		40				1'4					100		
INTERSECTOR 1	20	4	7	12		35				1'45					100		
INTERSECTOR 2	12	3	6'8	5'3		35				1'78					100		
FM6 FINISHER	5'3	1	10'0	0'53			GRY	0'5	5/6	3'4					100		
SPINNING	0'53	1	21'2		1/40			BLK		12'6	45	140	14	23	20		
AUTOCONER					1/40										1000	3/7/5	
HANEL					2/40										35		
VOLKMAN					2/40										35		
CLIL CORING					1/40										500	3/7/5	

SPECIAL INSTRUCTIONS:- STEAM SINGLES @ 90°C SINGLE CYCLE
STEAM TWOFLY @ 90°C DOUBLE CYCLE

SPECIAL INSTRUCTIONS:- NOTE WITH THIS BLEND IT IS NECESSARY TO WATCH WEAR ON THE FOLLOWING MORE CLOSELY THAN EVER.
DRAFTING AIRONS - ALL DRAFTING ROLLERS - GUIDES - RING SEPARATORS - TRAVELLERS
STEAM SINGLES @ 90°C SINGLE CYCLE
STEAM TWOPLY @ 90°C DOUBLE CYCLE

KNITTING FACILITY - HIGH TEC YARNS - PROCESS STANDARDS

STYLE WEAVING QUALITY 30/70 WOOL/POLYESTER FIBRE ORIGIN

BLEND DETAILS 30 % WOOL 70% POLYESTER DEN/MIC 23 m / 3 D } 18'4 m MEAN LENGTH 62 mm 65/100 VC

COUNT 2/40 nm SINGLES TWIST 500 Z TWOFOLD TWIST 480 S ADDITIVE NOTCH LV 40

REMARKS TWIST FACTOR SINGLES 80 TWOFOLD 107 BLEND WOOL/POLYESTER ON BLENDER DELIVERY 20 GRMS MT	GRAMS INPUT	DOFFINGS	DRAFT	GRAMS OUTPUT	COUNT	RATCH	CONDENSOR	APRON GAP	APRON PRESSURE WEIGHT	U% STANDARD	THICK PLACES STD	THIN PLACES STD	NEPS STD	TRAVELLER	DELIVERY RMS	CLEARER SETTING	
DE FELTER																	
AUTO BLENDER				20		45									100		
AUTO LEVELLER	20	8	8	20		45				1'4					100		
INTERSECTOR 1	20	4	7	12		40				1'45					100		
INTERSECTOR 2	12	3	6'8	5'3		40				1'78					100		
RM6 FINISHER	5'3	1	10'0	0'53			GRY	0'75	6/7	3'4					120		
SPINNING	0'53	1	21'2		1/40			BLK		12'6	35	110	10	22	22		
AUTOCONER					1/40										1000	3/7/5	
HANEL					2/40										35		
VOLKMAN					2/40										35		
CLIP CONING					1/40										500	3/7/5	

SPECIAL INSTRUCTIONS:- WIND THROUGH MECHANICAL CLEARER TO REMOVE NEPS.
DO NOT STEAM. FOR 3/16 nm 3 PLY TWIST. 190 TPM S. TWIST FACTOR 33.

KNITTING FACILITY - HIGH TEC YARNS - PROCESS STANDARDS

STYLE KNITTING HAND | QUALITY H.B. ACRYLIC | FIBRE ORIGIN CARDED FIBRE

BLEND DETAILS 40% REGULAR 35% H.B. 25% BICOM. DEN/MIC 3 DEN | MEAN LENGTH 76/126 mm

COUNT 4/16 nm | SINGLES TWIST 300 Z | TWOFOLD TWIST 160 S | ADDITIVE NOPCO LV 40

REMARKS MAKE 15 GRAMS FROM CARDING. BLEND TO PRODUCE 27 GRMS MT. SPIN TO 1/19 nm TWIST FACTORS SINGLE 69 FOUR PLY 33	GRMS INPUT	DOUBLINGS	DRAFT	GRMS OUTPUT	COUNT	RATCH	CONDENSOR	APRON GAP	APRON PRESSURE WEIGHT	U. STANDARD	THICK PLACES STD	THIN PLACES STD	NEPS STD	TRAVELLER	DELIVERY MTS	CLEARER SETTING	
DE FELTER																	
AUTO BLENDER	15	12	6'6	27		45									100		
AUTO LEVELLER	27	8	8'0	27		45				1'1					100		
INTERSECTOR 1	27	4	6'75	16		40				1'3					100		
INTERSECTOR 2	16	4	6'4	10		40				1'4					100		
FM6 FINISHER	10	1	10'0	1'0			GRY	1'5	10	2'2					100		
SPINNING	1'0		19'2		1/19			GRN		7'8	12	77		18	21'5		
AUTOCONER					1/19										1000		
RAMEL					4/19										35		
VOLKMAN					4/19										35		
CLIP CONING					1/19										500		

KNITTING FACILITY - HIGH TEC YARNS - PROCESS STANDARDS

STYLE HOSIERY | QUALITY H.B. ACRYLIC | FIBRE ORIGIN CARDED FIBRE

BLEND DETAILS 40% REGULAR 35% H.B. 25% BICOM | DEN/MIC 3 DEN | MEAN LENGTH 76/126 mm

COUNT 2/16 nm | SINGLES TWIST 300 Z | TWOFOLD TWIST 160 S | ADDITIVE NOPCO LV 40

REMARKS MAKE 15 GRMS MT. FROM CARDING. BLEND TO PRODUCE 27 GRMS MT. SPIN TO 1/19 nm TWIST FACTORS SINGLES 69 TWOFLY 52	GRMS INPUT	DOUBLINGS	DRAFT	GRMS OUTPUT	COUNT	RATCH	CONDENSOR	APRON GAP	APRON PRESSURE WEIGHT	U% STANDARD	THICK PLACES STD	THIN PLACES STD	NEPS STD	TRAVELLER	DELIVERY MTS	CLEARER SETTING	
DE FELTER																	
AUTO BLENDER	15	12	6'6	27		45									100		
AUTO LEVELLER	27	8	8'0	27		45				1'1					100		
INTERSECTOR 1	27	4	6'75	16		40				1'3					100		
INTERSECTOR 2	16	4	6'4	10		40				1'4					100		
FM6 FINISHER	10	1	10'0	1'0			GRY	2'5	10	2'2					100		
SPINNING	1'0	1	19'2		1/19			GRN		7'8	12	27		18	21'5		
AUTOCONER					1/19										1000		
HANEL					2/19										35		
VOLKMAN					2/19										35		
CLIP CONING					1/19										500		

SPECIAL INSTRUCTIONS:- WIND THROUGH MECHANICAL & LUB CATCHERS TO REMOVE NEPS
DO NOT STEAM

KNITTING FACILITY - HIGH TEC YARNS - PROCESS STANDARD

STYLE HOSIERY | QUALITY H. B. ACRYLIC | FIBRE ORIGIN TOPS

BLEND DETAILS PLAN II | DEN/MIC 3 | MEAN LENGTH 76/126 mm

COUNT 2/32 nm | SINGLES TWIST 420 Z | TWOFOLD TWIST 190 S | ADDITIVE NOPCO LV 40

REMARKS SPIN TO 1/37 nm TWIST FACTORS SINGLES 60 TWOFOLD 44	GRAMS INPUT	DOUBLINGS	DRAFT	GRAMS OUTPUT	COUNT	RATCH	CONDENSOR	APRON BAR	APRON PRESSURE WEIGHT	U STANDARD	THICK PLACES STD	THIN PLACES STD	NEPS STD	TRAVELLER	DELIVERY MTS	CLEARER SETTING	
DE FELTER																	
AUTO BLENDER																	
AUTO LEVELLER	18	10	8	22'5		45				1'1					100		
INTERSECTOR 1	22'5	5	8	14'0		40				1'3					100		
INTERSECTOR 2	14'0	4	8	7'0		40				1'65					100		
RM6 FINISHER	7	1	10'0	0'7			GRY	2'5	10	2'65					120		
SPINNING	0'7	1	25'9		1/37			GRN		10'5	15	22	7	22	23		
AUTOCONER					1/37										1000	3/7/5	
HANEL					2/37										35		
VOLKMAN					2/37										35		
CLIP CONING					1/37										500	3/7/5	

SPECIAL INSTRUCTIONS:-

KNITTING FACILITY - HIGH TEC YARNS - PROCESS STANDARDS

STYLE HOSIERY | QUALITY H.B. ACRYLIC | FIBRE ORIGIN TOPS

BLEND DETAILS PLAN I | DEN/MIC 3 DEN | MEAN LENGTH 76/126 mm

CUTTP 2/32 mm | SINGLES TWIST 420 Z | TWOFOLD TWIST 190 S | ADDITIVE NOPCO LV 40

REMARKS SLIVE TO 1/37 nm TWIST FACTORS SINGLES 69 TWOFOLD 44	GRAMS INTO	DOUBLINGS	DRAFT	GRAMS CUTTP	COUNT	TWIST	CONDENSER	APRON GAP	APRON PRESSURE WEIGHT	U STANDARD	TOP FLATS STD	TOP FLATS STD	NEPS STD	TRAVELLER	DELIVERY RPS	CLEARER SETTING	- - -
DE MELTER																	
AUTO BLENDER																	
AUTO LEVELLER	18	10	8	22'5		45				1'1					100		
INTERSECTOR 1	22'5	4	8	11'25		40				1'35					100		
INTERSECTOR 2																	
RM6 FINISHER	11'25	1	16'0	0'7			GRY	2'5	10	2'65					120		
SPINNING	0'7	1	25'9		1/37			GRN		10'5	15	22	7	22	23		
AUTOCONER					1/37										1000	3/7/5	
PANEL					2/37										35		
VOLKMAN					2/37										35		
CLIP CONING					1/37										500	3/7/5	

SPECIAL INSTRUCTIONS:- ONLY APPLICABLE IF SUFFICIENT FIBRE CANS ARE AVAILABLE TO ENABLE EFFICIENT FEEDING OF RM6
OTHERWISE USE PLAN II

APPENDIX X

RAW MATERIAL

INTRODUCTION

As of now KF has two requirements in respect of raw materials. 100 wool and 100% acrylic. No doubt the future will bring further requirements as product development hopefully goes ahead. These additional requirements are envisaged as regular Acrylic for use in blends of Wool and Acrylic. Here it should be noted that my forthcoming remarks on Wool Top/Parameters, do not necessarily apply in case of Blends. Normally an inferior Wool Top can be utilized in Blends of Wool and Synthetic. Producing both a satisfactory yarn and a substantial cost advantage. Eventually as Polyester becomes available, blends of Wool/Polyester and Polyester/Viscose, may be included in the production programme. Parameters and guidelines are given in the section "High Tec" Yarns, as also suggestions for some of these Blends.

1.1 WOOL TOP SUPPLIES:- As of now KF is very much in the hand of local top makers for supplies. In practice this means KF has

a) To accept what is available

b) Run the risk that nothing is available.

As in every other aspect of life there has to be a certain flexibility and "Grey" area. It is the declared object of KF to demonstrate the production of a superior Yarn. Whilst new technology can and will (provided Parameters are observed), produce a high quality product. It cannot perform miracles and produce a superior product from an inferior raw material.

In order to establish and maintain a superior quality product, it is important that KF establish:

a) Its product range and quality

b) Wool Top Parameters required

c) Establish a pipeline to fill its requirements on a regular basis, with Trust Worthy Suppliers.

1.2 WOOL TOP PARAMETERS

These will be determined by four factors:

a) Price
b) Spinnability
c) End use
d) Availability

KF is likely to suffer from (d) availability for the time it is dependent on local suppliers for spot purchases. In this direction the sooner its own pipelines are established the better.

a) Price An advantage can sometimes be gained here by "Forward" buying. It is not advocated at KF at this time, requiring as it does a deep knowledge of the market and price trends. At best it can be a gamble, I do not advise the KF to make. Rather should judicious blending determine eventual raw material cost, bearing in mind spinnability and end use.

b) Should a blend "make up" be such,that spinnability is lost, simply on cost. High wastage and an inferior product, is likely to cost a great deal more. Fibre diameter and Fibre Length are the two Parameters having the greatest effect on Spinnability, with crimp, type and quantity of additive playing a smaller role. Do not add oil to +1. total Fatty content. Fibre Diameter (Microns) determines the number of Fibres per x section in a given count of Yarn. To underspin (that is having more Fibres per x section than necessary) will produce a sound yarn, but unless justified by end product requirements and selling price can be a costly exercise.

To overspin (that is having less Fibres per x section than necessary) in order to product to a pre-determined price level may prove to be a costly exercise when waste and complaints on Yarn quality are taken into account. Fibre length for long not given the attention it deserved, is now recognised as having a very important role to play in the production of a good Yarn. Fibre length provides the binding force necessary to produce a good spin, and hence a good sound yarn. One prominent Researcher puts it:-

"An increase in the C.V of Fibre Dia. Can be responsible for a deterioration in spinning power".

That is to say Blends of different microns of similar length, may decrease spinnability.

On the other hand the same Researcher states, "An increase in the C.V of Fibre length can often enhance spinning power". Within reason therefore, we may blend different wools having different parameters, provided, we bear length in mind.

c) It must be well understood here that the above statements on Fibre Diameter and Fibre Length, are not to imply that a Good Yarn cannot be expected from a shorter Fibred Top. It can be taken to mean, that if an excellent Yarn is required then the foregoing Parameters must be borne in mind, that I believe to be the object of KF.

COMPARISON OF DIFFERENT BLENDS PRODUCTION
AT KF AND COMPARISON WITH OTHER SPINNINGRS

TABLE II

BLEND		KF lot	Cost to SF (in Rs.)	Average Micron	Average Length	Nominal NM	Actual NM	U%	Thick places	Thin places	Neps	Rating	
Uster 25	Experience Values					1/31	-	13'4	31	93	13	-	
Morani Woollen Mills	50%	25	109'96	22'75	57'5	1/31	1/31'42	13'51	54	112	37	2*	Joint 2
Wellman	50%												
Wellman	30%												
Punjab Wool Combers	70%	29	112'60	32'7	61'0	1/31	1/31'25	13'23	41	82	8	1	
Punjab Wool Combers	25%	39	109'54	22'6	57'5	1/31	1/31'12	13'56	58	97	19	2*	Joint 2
Woolcombers India	75%												
Wellman	100%	40	108'04	22'5	55'0	1/31	1/31'4	13'71	68	114	59	3	
Oswal Woollen Mills						1/31	1/30'75	14'07	70	164	108	4	
I.W.C.						1/31	1/30'25	13'97	122	235	148	6	
Ahlarson						1/31	1/29'5	15'25	64	180	83	5	

Your attention is directed to the Graph, showing count Vs Fibres per x section. The legend brings out an Estimate only of the Fibre Length, versus Fibre Diameter.

1.3 EXPERIENCE VALUES:- The following yarns have been produced by KF comparison is shown with "USTER" experience values and with local spinners. Cost per Kilo of Wool Tops is also shown Table (II).

It will be seen that it is highly feasible to produce a reasonable yarn from the shorter Tops but with increased waste and floor sweepings the cost advantage is minimised and even converted into an excess.

I have no hesitation in recommending the following in order that:-

a) KF quality standards be maintained

b) Raw Material cost be kept to a minimum

TABLE III

Metric Count	Blend	AV Microns	AV Fibre Length	Cost in Rupees
1/31 & 1/25 Nm	25% 75%	22'9	62 + 55	109'54
1/42 Nm	50% 50%	22'9 22'5	62 + 55	111'62
1/48 Nm	100%	22'5	65 +	114'1

1.4 If however KF is to fulfill its goal of producing a Superior Product, the following parameters are recommended:

TABLE IV

Metric count	Mean Fibre Length	Average Microns	% total Fatty matter
1/48	65 mm MIN	20	0'5 - 0'8
1/42	65 mm MIN	22	0'5 - 0'8
1/36	63/65 mm	22'5	0'5 - 0'8
1/32	60/65 mm	22'7	0'5 - 0'8
1/26	60/65 mm	22'7	0'5 - 0'8
1/26	65/70 mm	24'0	0'5 - 0'8
1/16	70 mm	24 - 27 mm	0'5 - 0'8

AGAIN it is emphasised you do not necessarily require the above to produce a good Yarn but they are required if your declared aims are to be fulfilled.

1.5 HIGH BULK ACRYLIC: is available in Fibre and occessionally in Tops. In each case specifications are the same i.e. Fibre Length 76 - 126 mm variable cut Fibre Diameter 3 Denier. Blends may be:-

a) 60% Regular
40% High Bulk

b) 40% Regular
35% High Bulk
25% Bi-component

There would appear to be no reason why 3 Denier Acrylic could not be used successfully with hand knitting types. Blended in the same proportions, one would anticipate carded Fibre producing a considerably less Neppy Top.

NUMBER OF FIBRES IN THE CROSS-SECTION (PURE NEW WOOL)

Dia	17.0	17.5	18.0	18.5	19.0	19.5	20.0	20.5	21.0	21.5	22.0	22.5	23.0	23.5	24.0	24.5	25.0	25.5	26.0	26.5
16	176	166	157	149	141	134	127	121	115	110	105	101	96	92	88	85	81	78	75	72
20	158	150	141	134	127	120	115	109	104	99	95	90	87	83	80	76	73	70	68	65
24	132	125	118	112	106	100	95	91	87	83	79	75	72	69	66	64	61	59	56	54
28	113	107	101	96	91	86	82	78	74	71	68	65	62	59	57	54	52	50	48	47
32	99	93	88	84	79	75	72	68	65	62	59	57	54	52	50	48	46	44	42	41
36	88	83	79	74	70	67	64	61	58	55	53	50	48	46	44	42	41	39	38	36
40	79	75	71	67	63	60	57	54	52	50	47	45	43	41	40	38	37	35	34	33
44	72	68	64	61	58	55	52	50	47	45	43	41	39	38	36	35	33	32	31	30
48	66	62	59	56	53	50	48	45	43	41	39	38	36	35	33	32	31	29	28	27
52	61	58	54	51	49	46	44	42	40	38	36	35	33	32	31	29	28	27	26	25
56	57	53	50	48	45	43	41	39	37	35	34	32	31	30	28	27	26	25	24	23
64	50	47	44	42	40	38	36	34	32	31	30	28	27	26	25	24	23	22	21	20
72	44	42	39	37	35	33	32	30	29	28	26	25	24	23	22	21	20	20	19	18
76	42	39	37	35	33	32	30	29	27	26	25	24	23	22	21	20	19	19	18	17
80	40	37	35	33	32	30	29	27	26	25	24	23	22	21	20	19	18	18	17	16

LEGEND

—·—·—· FIBRE LENGTH 65 - 70 mm

– – – – FIBRE LENGTH 60 - 65 mm

———— FIBRE LENGTH 55 - 60 mm

APPENDIX XI

CONDITION OF YARNS

with the sales of wool tops invoiced at the standard 18¼% regain. Yarn invoiced at scale weight. The spinner is put under pressure to get his own back.

As of now, yarn customers are not interested in discussing invoicing @ 18¼% regain, for the obvious reason, that they in turn do not accept, that they should pay for an invisible loss.

1.1 With spinners trying to gain by adding oil and condition, packing in plastic bags etc., complaints of short weight are bound to occur, with the atmospheric R.H. lower than factory R.H. for a great part of the year. Here one can only offer suggestions, there is no magic wand to wave. For example, the spinner could:- deliver weight plus so avoiding complaint, deliver at atmospheric regain.

In neither case does the spinner stand to gain, but rather the reverse.

Alternatively: Mark all packages X kilos when packed.

Mark all packages - subject to loss in weight by evaporation.

Both the above suggestions would require the acceptance of the customer.

1.2 The long term solution and the only solution, is to invoice at 18¼% regain. An internationally accepted system approved by all authorities.

Again it requires the customers acceptance in principle.

1.3 Without doubt to my mind, this is where the WP should take the lead.

a) By organising a seminar to explain the ramifications involved in invoicing at 18¼% regain, both commercially and technically.

b) By acting as the "Conditioning House" between seller and buyer. Issueing certificates showing conditioned weight.

APPENDIX XII

OPERATING INSTRUCTIONS

GENERAL RUNDOWN AND AUXILIARIES

The purpose is to give in comprehensive form the do's and don'ts involved in processing, handling, storage requirements etc.

1. A good safe, well planned top store, in which incoming goods can be held without damage, or danger of mixing, until required. Provision should also be made for part processed material i.e. superwash tops.

   Bins (2 storeys high) capable of holding some 4/500 kilos each should be planned.

   All surfaces in contact with material should be covered with hard board. Nail heads must be recessed with a suitable punch.

2. Boards affixed to each bin should carry all relevant information i.e. type - colour - kilos - lot no. etc. Apart from giving the required information and assisting in avoiding mistakes, the information helps in stock taking. Which I would suggest initially be every month end.

3. Material in and out of tops stores, should be recorded by a responsible person. Watch carefully tops from superwash. Accidents do occur. There is a tendancy to make up for the loss in waste by water.

4. Do not have top store at too high RH., especially with synthetic blending.

   There are 2 blending passages. Defelter and Autoleveller Intersector. These would mostly be intended to follow superwash. De-felter from can feed to can delivery. The Auto-leveller ball feed to ball delivery, this latter for easier storage and further processing.

   Tops delivered should be stored neatly in a plastic trolley.

   Brief instructions are following:-

   1. How to operate the defelter
   2. The Autoleveller
   3. Piecenings or joinings
   4. Comments on training
   5. FM6 Finisher
   6. Zinzer ring spinning
   7. Schlafhorst Autocoaner
   8. Hamel and Volkman
   9. Mettler and Hirchberger
   10. Reeling

OPERATOR'S TRAINING

Following are general comments on the various processes for your guidance. You will find under the circumstances normally prevailing in a factory, that training can be time consuming, but it must be done.

The simplest way of "Shop Floor" or on "the Job Training", is what may be termed the "Step and tie" method. This entails breaking each job down into reasonable steps. Teaching one step at a time.

When 2 steps have been satisfactorily taught, tie the 2 steps together and so on.

For Example - Gill Box Operator

Step 1 How to pick up and handle tops

Step 2 How to place the top on the machine

Step 3 How to start the top into the machine

Step 4 How to repair a broken end

Step 5 What the various signal lamps indicate

Step 6 How to start and stop the machine

Step 7 How to thread the coiler

Step 8 How to doff the machine

The same general pattern to be followed throughout each section, i.e. Finisher - Ring Spinning - Autoconer - Hamel - Volkman - Winding - Reeling.

PIECENING ON A GILL BOX

1. One method of Piecening (i.e. repairing a broken or missing feed sliver), is to take the two separate ends, square them off and carefully lay the squared ends in a slightly over-lapping position.

   Cohesion is obtained by rubbing the overlap between the hands.

This method whilst favoured by many has the following drawbacks:

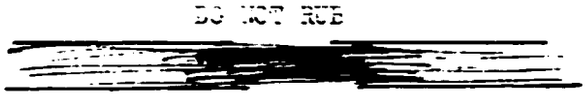
a) It is an almost certain way of creating a fault in the yarns. Relying on an end break in roving or spinning to remove it, or be cleared in winding by slub catchers.

b) Unless very expertly done, an end break often results at the delivery end. This again necessitating a piecening at the next operation together with attendant waste.

c) Operators frequently have dirty hands. This method of rubbing the slivers, often results in a substantial area of dirty sliver, often creating dyeing problems.

2. Another method is to again carefully square off the Sliver ends.

With the detector roller up, draw the new sliver to a position just over the old x sliver. A very slight overlap is allowed and the new sliver tucked carefully into the mass is carried forward.



Again there are drawbacks.

a) Too long an overlap will result in a thick sliver and hence a substantial length of thick yarn.

b) Too short an overlap, a gap will result in a long length of thin yarn.

However if <u>carefully</u> and <u>correctly</u> done, this method is favoured over the rubbing method.

<u>NOTE</u>:

An exception is piecening on the Autoleveller. The mechanism cannot correct faults in the very short term.

It is better therefore, to provide an overlap, or a gap, of at least 10 cms. Thus allowing the mechanism time to correct the fault, be thick or thin.

PREPARATION

DE-FELTING - JOB SPECIFICATION

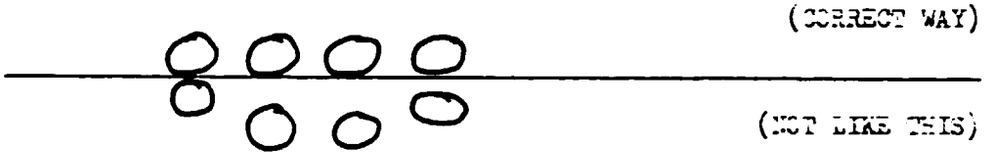
1. The machine to be kept in a clean and tidy condition at all times.

2. Ensure your machine has been checked by your Supervisor before starting.

3. Ensure that no material whatever remains on or around the machine from any previous lot, if you find any hand it to your Supervisor.

4. Your material will normally be given to you in cans. Check each can very carefully before beginning a new lot and afterwards all other cans you use, if you have any doubt or suspicion that everything is not absolutely correct, draw the attention of your Supervisor. In particular check the colour and the number of sliver in cans.

5. You will be told by your Supervisor how many cans to feed. If for example you are told to feed 8 cans, do it like this (as shown in the figure).



All your cans must be directly under the guide ring, like this (as shown in the figure).

6. All or any detector rollers not in use, will be blanked off with a bright coloured pipe. You are not to remove them.

7. Once you are satisfied that you have checked and your Supervisor gives you permission to start, lift up all the Detector Rollers and thread each Sliver through the Guide Ring - round the Guide Roller and carefully to the back Rollers. When all Slivers are in position square off the ends, and carefully feed into the back Roller by the inching button.

8. Once material has passed through the Fallers and out via the Front Roller, return to the back of the machine and carefully lower all detector Rollers to the running position.

9. Inch further until you have a sufficient length of Sliver to thread to the Coiler, insert into Coiler - inch forward. If all is in order you may start the machine.

10. Should your machine keep stopping (and the indicator lamp will show you why) draw the attention of your Supervisor to the problem.

It will be a simple matter to correct. You are not to attempt to correct the fault yourself, if it involves mechanical change.

Check you have fed Sliver correctly and all guards are correctly closed.

11. Do not block off Detectors with paper or other material, to prevent operation. This is punishable by disciplinary action.

12. Watch your fingers etc., at all times. We cannot buy you a new finger. Keep your mind on the job in hand and observe all standing orders.

INTERSECTORS

All intersectors are basically the same. One or more fitted with an "Autoleveller" and others with two or more deliveries. In addition to the comments on starting up and piecening the following must be borne in mind.

1. AUTOLEVELLER:

This machine is fitted with a mechanical device to produce an Even Level Sliver.

The measuring head theoretically operates to ± 15% in practice this is about 12 - 12½.

It is fitted with automatic stop motion to prevent over or under feed. A fault may occur everytime the machine is stopped by this device. You must always draw your supervisors attention to such stoppages.

2. FEEDING BACK WASTE SLIVERS:

With a correctly set autoleveller, it is possible to feed in short length of sliver i.e., test length etc. This is the only machine at which you may do this. The intersector is not a CARDING MACHINE. DO NOT FEED BACK SOFT WASTE.

3. DOUBLINGS

You will be told by your supervisor how many tops - cans etc., you must use at each machine. This must never be changed during a blend. See always the correct number of slivers is present. Take special care on machines with more than one delivery, for example, on the last intersector, which has three deliveries, you may be told 3-3-3 - do not get 2-3-4.

4. BLENDING

On occasion you may be given a blend to process on the first autoleveller. This may be:-

a) A mixture of one or more different wools.

b) A mixture of wool and synthetic etc.

Take particular care that all the top cans are correct. If you are told 4 wool and 3 acrylic for example, you must on no account change this proportion.

5. GENERAL:

a) Keep your machine and work area clean and tidy at all times.

b) Handle all tops - cans - slivers with care. Rough handling creates faults

c) Do not use sliver cans for any other purpose than that for which they are supplied.

d) Check under the spring loaded platform of the cans - see that no waste has gathered there.

See that cans are clean at ALL TIMES.

e) Constantly check that cans you use are in good condition. Check especially the metal rims, report any sharp edges to your supervisor.

WORKING METHOD FOR F16 FINISHER:

Your machine has 16 spindles or bobbins, two slivers are fed onto each bobbin. Only one sliver per can is delivered at the last intersector. You must therefore, feed 32 cans to the machine.

1. Place your cans under the feed creel, neatly in blocks of 16 cans. Feed over the correct creel rollers, making sure slivers are in the correct guides. Double check to be sure you have no crossed slivers, this will cause faults. Take care to avoid bearings at each end of the roller.

2. Proceed to feed into the back rollers via the back condensor. Make sure from your supervisor that the back condensor is the correct size.

3. Inch the machine until drafted slubbing appears in front of the rubbers. Check that all 32 slubbings are through. If not check for apron laps etc.

4. Thread the slubbing correctly through the detectors and guides. Attach to bobbins.

5. Now insert the correct front condensors, you will be told which colour by your supervisor. Do not use condensors of incorrect colours.

6. GENERAL:

a) Keep your machine neat and tidy at all times

b) Watch feed slivers carefully and if you have doubts inform your supervisor.

c) An apron lap often leaves a part slubbing in such cases check the roving bobbin and pull back all faulty slubbing.

d) Do not change roving bobbin colour without permission and see your roving is neatly stacked at all times.

e) At doff check all rovings before allowing them to pass. In case of doubt refer to your supervisor.

7. Roving bins should be free from protrusions and/or roving trolleys (already designed) should be used at all times. Roving must be stacked in bins horizontally.

LINDER RING SPINNER:

Your machine is automatic and does not require your intervention to initiate doffing. It will automatically come to the underwind and doffing position and the machine will stop. Doffing then takes place and the machine will return to the spinning position by pressing the start button.

THE PROCEDURE FOR SPINNING IS AS FOLLOWS:

1. Make sure your machine is thoroughly cleaned. That no old bits of roving remain, or part spinning bobbins from previous lots.

2. See that all spindles have a correctly coloured empty tube, do not allow tubes containing even the smallest amount of waste.

3. See that all rings carry the correct ring traveller. Take care with ring travellers, they are expensive. Do not place ring travellers in the mouth.

4. See that the machine is in the correct starting position.

5. Creel Roving on bobbin holders. By simply pushing the bobbin upwards. The bobbin holder is made in such a way that it will automatically grip the bobbin. Take care to creel all rovings the same way up i.e. the roving coming from the right side of the bobbin in each case.

6. Your supervisor will have correct yarn (which he has obtained from the count testing samples). Ask for these bobbins and put your start up thread onto the spinning tubes. Take care that the start up thread (carrier thread) is as near to the bottom of the tube as you can get it, otherwise difficulty in winding off will occur.

Do not use more carrier thread than necessary.

ON NO ACCOUNT

Use a thread or yarn except that obtained from your supervisor, when you have applied carrier thread to all tubes, hand what remains of the yarn back to your supervisor.

7. When all is ready call your supervisor, he will gather all the spinners to your machine.

START SPINNING BY:

a) Pressing down the pendulum arm FULLY to the spinning position. See that the drafted end is going correctly into the pneumatic tube and not lapping on aprons or rollers.

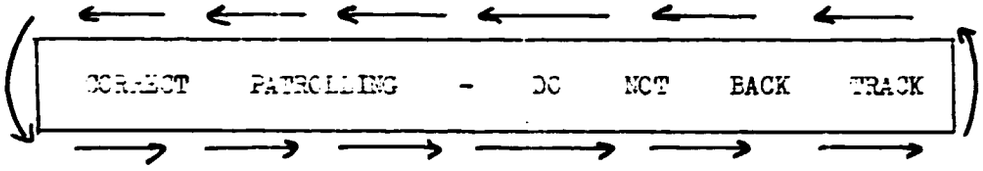
b) Find the carrier thread. Thread under ring traveller - into the anti baloon ring - up through the lappet guide.

c) Flick down the pneumatic tube and piecen neatly. Do not forget to replace the pneumafil tube in the UP position.

d) You have now commenced spinning and your inside work now consists of patrolling your machine correctly. Keep your eyes wide open for faulty roving - which you should hand over to your supervisor.

For double spinning which if it occurs you are to remove.

Any other problem or difficulty which you may not understand draw the attention of your supervisor. You will not get into trouble, if wher in doubt you ask questions. You will get into trouble, if you have doubt and do not ask question.



6. Doffing should take place directly into the plastic steaming baskets, Each basket containing one spinning side.

Smaller containers clipped to the ends of the doffing basket carry half side of empty tubes each to facilitate doffing.

RUNNING OUT:

Running out is the term used when a lot or blend is coming to an end. The principles which should apply are:

1. Always see that the fullest or largest package is on the machine and running.

If not, you may have to wait hours for only one or two spindles. This is ineffecient and costs money in power consumption and operator time. For example, on spinning you have a full set of roving bobbins + 20 bobbins x 2 ends snare. If you leave the machine to run out, you will have to run the machine with only 40 spindles. To avoid this you must BREAK IN.

a) Break out the first 20 rovings on the machine spindles and replace with the 20 full bobbins.

b) Run the machine for one doff. At doff, break the second 20 rovings spindles 41 - 80 and replace with the part full roving removed from spindles 1 - 40. Repeat the procedure every doff, until roving is exhausted.

AND SC/CN	SP 41 - 80	SP 1 - 40

2. It is easy to just allow a machine to run out of its own accord. This method should not be used. Excessive part bobbins are created. Auto coner efficiency is reduced. The remarks apply to all processes. You should therefore:-

a) Before run out takes place, reduce the number of spindles running.

b) Use the packages from standing spindles, to ensure a full package on running spindles.

c) Your supervisor will let you know when to BREAK OUT.

FOR EXAMPLE

Your full package looks like this 

when your package becomes like this 

and you have no more packages to feed:-

Then breakout as below carry on until all is finished.

BREAK OUT	RUN USING ALL BOBBINS

NOTE: For Yarn doffing - steaming etc., use only the correct doffing containers.

OPERATOR INSTRUCTIONS AUTOCONER:

1. When given a new lot of yarn make sure that:-

   a) No part spinning tube remains - anywhere

   b) Any cones from previous lot are cleared away

   c) The machine and work area is clean and tidy

   d) You have the correct cone colour given by your supervisor

   e) That your supervisor has made all the required setting.

2. You may then start production by filling the magazines with full spinning tubes. Pulling back the underwind until yarn comes from the top of the spinning tube. Insert spun thread into central suction tube. Take care sufficient yarn enters the suction tube for a firm grip. It is important that you check full spinning tubes carefully. At the same time the magazine creel is being loaded. Check that:-

   a) Tube colour are all the same. Do not use a spinning tube which is a different colour - unless you have specific permission.

      If mixed yarn results you must bear your share of the responsibilty.

   b) Check and ensure no yarn faults are visible. If any faults are visible, or you are in doubt - inform your supervisor.

   c) Should spinning tubes have an identification mark i.e. chalk mark. Ensure all spinning tubes have the same mark or colour.

3. Now see your empty cone magazine is loaded with the correct cone colour and that they are free from waste. With no spoilt or sharp noses. This will interfere with winding off.

4. You are now ready for winding. Taking the empty cone of the first spindle in your left hand, start the travelling knotter at the first spindle.

   This will cause the first spinning tube to be automatically fed into the correct winding position via tension and clearers. Take the thread in your right hand and give 2/3 wraps round the empty cone. Insert the cone between the adaptors and winding can commence. Repeat this for all spindles in your charge. In knitting facility this will normally be 25 spindles.

5. Winding will now proceed automatically, but never forget whilst the machine is automatic, it cannot perform miracles.

A Red light indicates the knotter has been made the normal (3) No's of attempts to knot and failed. This may be due to a number of reasons.

a) A badly formed spinning tube.

b) Sharp edge at tip of spinning tube.

c) A yarn fault protruding causing breakage.

d) Lost end on cone, not being picked up by suction arm.

e) Faulty knotting bill.

f) Thread suction tube blocked.

With the exception of (e) and (f), and these should be reported to your supervisor, the other faults can be easily corrected with minimum human assistance.

An orange light indicates the package has reached a pre-determinded diameter and must be manually removed and replaced with an empty cone.

Examine the cone very carefully for faults, before depositing it in its appointed place. Keep your machine clean and tidy at all times. Cleaning at the end of each shift is required with the aid of compressed air.

OPERATOR INSTRUCTION MANUAL TWISTING STAGE I

1. See that your machine is thoroughly cleaned and free from fly waste - thread waste and dust.

2. See that no yarn exists on or around the machine on cones - metal bobbins whatever.

3. Your bobbins carry identifying discs in different colours. Ensure that all bobbins carry the correct disc colours instructed by your supervisor.

4. Yarn will be provided by your supervisor. Make sure you understand any identifying marks, which might be used.

5. When you have your supervisors go ahead, start up as follows.

6. Creel your cones in the upright creel, through the ceramic guide and tension discs, up to the yarn detector twizzle, over the top ceramic disc guide and down to the delivery units.

7. See that delivery unit is correctly wrapped, and come down through the pig tail guide, under the ring traveller and attach to bobbin.

NOTE: Your twisting spindle revolves from left to right (anti-clockwise), take care to thread yarn under traveller in the same direction to avoid excess and breaks.

8. Now engage delivery unit and pre-twisting commences. The spindles deliver a pre-determined length. When doffing ensure bobbins are neatly stacked on trays provided.

OPERATING INSTRUCTIONS HAMEL STAGE II

1. See that your machine is thoroughly cleaned and free from fly waste - thread waste and dust. Pay particular attention to cleanliness of the pots.

2. See that no yarn exists on or around the machine - trolleys etc.

3. Use only the cone colour designated by your supervisor.

4. Yarn will be provided on trolleys by your supervisor. Make sure you understand any identifying marks.

5. When you have your supervisors go ahead, start up the machine as follows.

6. Set the pre-twisted package carefully into the pot. Locate correctly on the spindles.

7. Thread through the pot lid and replace the lid.

8. Carefully thread the multiple twizzle guide and up via guide to the upper and lower decks, for alternate spindles. Attach to empty cone and commence twisting.

9. Carefully pack full cones into bins provided for reeling or in to trolleys for despatch department.

OPERATING INSTRUCTIONS VOLKMAN 2 x 1 TWISTER:

1. See your machine is thoroughly cleaned and free from fly waste, thread waste and dust.

2. Check that no yarn exists on or around the machine on clip cones or assembled packages.

3. See that you have the correct cone colour on all spindles. All empty cones must be free from waste.

4. You will be given yarn by your supervisor. Make sure you understand any identification marks which might be used.

5. When you have your supervisors go ahead, start the machine as follows.

6. Creel in the clip cones to the pot. Take care the cones are the correct way up this is nose upwards. The top cone must clip neatly into the bottom cone.

7. Thread the two ends <u>together</u> into the flyer twizzle. Attach the two yarns together onto the end of your threading line.

8. Pass downwards through the hollow axle until threading line and yarn emerge. Now pass the threading line upwards between pot and balloon limiter, until it emerges.

9. Remove yarn from threading line and pass through the pig tail guide over the spindle. This guide is moveable, take care it is in the correct running position.

10. Now pass the yarn in front of the detector wire and up over the pre-take up roller to the empty cone. Two or three wraps round cone and lower the cradle to its running position.

11. Always use a waist knotter for knotting.

12. Store cones for reeling in bins provided or in trolleys for despatch department.

OPERATOR INSTRUCTIONS FOR HIRSCHBURGER CLIP JOINING

1. See that your machine is thoroughly cleaned and free from fly waste, thread waste and dust.

2. Check that no yarn on cops or cones, is on the machine or floor. If you find any, hand them to your supervisor.

3. See that you have the correct cone colour and that all empty cones are free from waste.

4. You will be given yarn to wind by your supervisor, make sure you understand any identification which may be used.

5. Once you have your supervisors go ahead, start the machine as follows.

6. Place the cop or cone on the creel peg. Pull thread up through accelerator eye, over the bottom yarn guide, along the top yarn guide, to the package holder.

7. Two or three wraps around the empty cone and press the strating lever firmly until locked. If you cannot lock the starting lever in the running position, the yarn is incorrectly threaded.

8. The yarn is self placing in clearers and disc tensions. Also waxing device if fitted.

9. Always use Hand Knotter.

10. Store the yarn carefully in the bins provided.

OPERATOR INSTRUCTIONS WAFFLER HANK TO CONE:

1. See that your machine is thoroughly cleaned and free from fly waste, thread waste and dust.

2. Check that no yarn on cops, cones or hanks is on the machine in trolleys or on the floor.

3. See that you have the correct cone colour and that all empty cones are free from waste.

4. You will be given yarn to wind by your supervisor. Make sure you understand any identification, which may be used.

5. When you have your supervisors go ahead, start the machine as follows.

6. Reduce the hank swift to its smallest diameter. Grip the swift shaft and pull out the knob in centre of swift, Place the hank on the swift and turn the swift wires until correct tension is reached.

7. Thread yarn over upper tension stop motion and down the lower guide. Round the delivery rollers (you will be told how many wraps, which must not be changed). Through tension weights to back guide.

8. Make two or three wraps around empty cone and depress starting lever.

9. If the upper tension stop motion, constantly stops the spindle, you have a tangled hank which must be corrected.

10. Always use hand knotter.

11. Store the cones in trolleys provided, ready for despatch department.

REELING

The term used to describe the process of hanking yarn for bulking and/or dyeing.

In our case we have only 3 machines and it is important we achieve the maximum production.

The operation itself is simple, requiring straight common sense. Good hanks are essential if minimum waste is to be obtained in later hank to cone winding. You must regard yourself in some respects as "Quality Control". This is the last chance we have to really examine the yarn, before it leaves the department.

You must therefore:-

1. Check all your supply cones carefully

   a) Cone colour or other identification mark.

   b) Look carefully at each and every cone. See if you can discern any fault. If you do, report to supervisor.

   c) Check the yarn twist by eye. Any doubts report.

   d) Be constantly watchful on every new package creeled, during reeling and especially during tying off.

   e) Before removing hankes give a twist of the reel, to confirm no faults are present.

2. Always use hand knotter in case of end breaks.

3. Use a different coloured tier for every lot as instructed by your supervisor.

4. Handle hanks very carefully at all time. Store only in plastic containers. Bad handling results in waste.

APPENDIX XIII

TECHNICAL ASSISTANCE

Technical Assistance work has been limited because of the time factor. However, certain companies have requested and received assistance.

a)	UNIT I (3 visits)	-	Excessive fly waste and ring traveller consumption
b)	UNIT II (3 visits)	-	Complete plant survey and recommendations
c)	UNIT III (2 visits)	-	Request for projects on wool scouring and combing.
			Top Dyeing and Backwashing - worsted spinning unit. Woollen spinning unit.
d)	UNIT IV	-	Difficulties spinning 100 wool yarn on "UNIFIL" spinning machines

We were approached by other companies but considered no serious purpose lay behind the discussions.

UNIT I

The unit was visited on Sunday 2nd June 1985, to investigate excessive traveller wear and high wastage from floor sweepings.

> "There is no doubt that a relationship exists between excessive traveller consumption and excessive floor sweepings".

Using a "Stroboscope" on the Ring Travellers showed the Traveller to be on the "JUMP" i,e. Skittering round rather than revolving smoothly. Here without doubt is the root cause of excessive traveller wear.

Further examination shows:-

a) Rings running dry

b) Some 40% of lubrication pads missing

c) Spindles off centre to Spinning Rings

d) Lappit thread guides off centre to Spindle.

There is little need to look further for the root cause of high level floor sweepings.

RECOMMENDATIONS

1) Examine all Rings very carefully for signs of wear.

2) I suggest a slightly lighter Ring traveller, could be used to advantage.

3) Attend to the ring lubrication system. Bring it back to full working order.

4) Centre all spindles to Ring Centres.

5) Centre all Lappit guides to Spindle centres.

UNIT II

Following my two visits to your unit on Saturday 22nd June and Wednesday 26th June 1985, I have the following points.

GENERAL:

Material handling in many cases takes a back seat. Despite the fact that it contributes directly to a number of faults and other problems.

1. Badly handling roving, contributes to spinning end breaks, yarn faults and waste.

   This applies especially to the twistless type roving, common to the dry spun system.

2. Similar comments can be applied to the spinning cops - twisting - cheeses and cones, hanks etc. With these the increased danger of mixed yarns.

DRAWING:

Most of my remarks apply equally to all machines. In any event a check will do no harm.

FINGER GUIDES:

The feed side of Gill Boxes, are fitted with wooden guides some of which are damaged. In any event they are easily damaged and cause severe snagging. I would recommend their replacement with metal guides, either stainless or plated.

BACK CONDENSOR GUIDES:

In the odd case these are missing. In most others incorrectly set. These guides are used to determine the area, over which the material to be drafted can spread. The only thing saving faulty drafting are the low drafts being applied.

TOP BACK ROLLER:

I advise a check on alignment. In the odd case, they are badly out. Fibre matting can occur.

DRAFTING ROLLER CLEARERS:

These clearers have as their purpose, the clearing off of fibres and clumps, to prevent forward passage with the sliver.

If they are in bad condition, or incorrect i.e. stuffed with cardboard, faults should be expected. I would recommend correctly made rubbers. In the meantime it may be an advantage to leave off.

DRAWING HEAD:

The false twist tubes (having been welded in some cases or braised in others), are a little rough. A good polish or plating would be a big improvement. False twist tube was digging into the top for the last 20 to 30 mm. This cannot do the sliver any good.

I suggest that the false twist tube might be shortened, the alternative is to make a smaller dia top.

FALLERS:

In some cases these are in very bad condition. Gaps of as much as 2 cm without pins common place, again not good. Damage results. Check all timing cams. Some of which are out of time. This should improve the faller pin consumption.

PRESSURE ROLLER:

Pressure is applied to drafting rollers by dead weight. In most cases these consist of a series of bricks. No doubt the weight is being applied but I suggest decent metal weights to the correct requirement.

I think here, the main point is impression. Bricks indicate anything will do. I believe it is important to create the correct atmosphere of caring and neatness. If cleanliness orderliness go out of the door, chaos with all its attendant problems, comes in through the window.

CREELS:

These are provided with a footstep bearing, in which the bobbin spindle is free to rotate. Keep a careful check on - cleanliness, cracked/missing or broken footsteps. See that correct alignment is the order of the day.

GUIDE RAILS:

Fitted with round plastic guides, whilst in good shape at present, it is as well the 'a' eye' is kept for missing or cracked guides.

TOP DRAFTING ROLLERS:

Whilst at present not in bad condition, there are signs of wear and grooving. both back and front. A very careful eye needs to be kept.

CARRIER ROLLER:

Of dead weight steel. Take care of alignment.

CLEARERS:

Again figure as a danger point. I think here, rather than the rather long intermittently bristled brush. A shorter but fully bristled brush, which revolves by friction with the top roller, would be of immense benefit. Again rubber tubing (available from Armstrong) would improve bottom roller clearing.

FRONT CONDENSORS:

These are of great importance, if a nice round roving is to be produced. I find quite a number missing, which should be given some priority by replacement.

FRONT-SLUBBING GUIDES:

Many have been broken and braised. Rough edges around. Another good case for polishing and plating. Also give attention to setting and alignment.

OSCILLATING RUBBERS:

Here many rubbers are worn smooth. All the original ribbing is long ago worn off. Slubbing relies on rubbing for its cohesion. Insufficient rubbing must eventually lead to excessive slubbing breaks.

I think a fair comment at this time would be, you are saved at the moment by the oil absorbed in the rubbers, making these somewhat sticky.

RING SPINNING:

3 spinning machines of 400 spindles each, ring dia. 55 mm, spindle r.p. 5500.

GENERAL:

It is felt that if the ring frames are in first class shape, a spindle r.p.m. of 6000 would be attainable.

This would give you on 1/42 nm twist 571 tpm a daily production of:-

$$\frac{6000 \times 60 \text{ min} \times 23 \text{ hrs} \times 1200 \text{ sps}}{1000 \times 42 \text{ ct} \times 571 \text{ t.p.m.}} = 414'8 \text{ @ } 100\%.$$

You should attain 85% plus with correct supervision or 352 kilos plus in the 23 hours running. The improved efficiency taken over a year amounts to some 15000 Kg (no Sundays included). More than paying for the efforts and small outlay needed to bring it about,

Further spin offs - would be:-

a) Reduced waste and fly

b) Reduced labour force. (See appendix)

ROVING GUIDES:

Back roving guides are of plastic, set in a metal holder. In a large number of cases the plastic is cracked or missing. This alone will: a) increase end brakes
b) increase waste and fly
c) a danger of rough or hairy/yarn.

TOP BACK ROLLERS:

These are of the dead weight type. Alignment needs checking, and with some brackets broken and tied with tape or string, false drafting is an ever present danger.

DRAFTING APRONS:

Constantly check for wear and replace as and when necessary. Small self weight pads fitted for cleaning the top drafting apron, are of dubious benefit. With some 40% missing anyway, I would suggest for the sake of uniformity they could be dispensed with.

TOP FRONT ROLLERS:

Again a careful check, for grooves, pits etc., should be made. A good number have been skimmed (very badly I must add) reducing the diameter and therefore the pressure. This apart from the fact that the pressure in my view, is a little light anyway. Is it time to think of investing in some new cots?

A good number of top front rollers have pressure maintained by pieces of wood driven into the pressure mechanism. All in all, an area which requires a substantial effort to correct.

ROLLER CLEARERS

These are not fitted at the moment, but could be fitted to advantage.

SPINDLES AND LAPPETS:

Spindles out of true with rings. Lappets not centralised over spindle tip, should be reset as a matter of priority.
The foregoing results in:-

a) increased end brakes

b) increased waste fly

c) uneven wear on rings

d) excessive traveller consumption

Lappets should also be checked for yarn cuts.

LIFTER AND RING RAILS:

Lifter mechanisms should receive immediate attention. Badly shaped cops - mean waste in winding off. Cops not being utilised to full capacity.

After which check alignment of ring rails.

SPLIT DRUM WINDING:

Possibly the oldest and certainly the simplist of all methods of winding. A general check on drum - tension brackets - alignment of tubes to guides, is recommended here.

The conditioning roller at the moment is revolving in the direction of yarn movement. It is worth bearing in mind that a greater pick up of condition can be achieved if required, by running the condition roller contrary to the yarn direction.

TWISTING:

General as for spinning on:-
Overhaul of lifter
Alignment of ring rails
Cut and grooved guides etc.
All leading to excess waste and fly

REELING:

Attention to thread guides, many of which are cut. Check reel diameters over length to prevent varying hank sizes.

SLUB CATCHERS:

Although slubs don't appear to present many problems. Due to the end products, I have yet to see an uncleared yarn which is slub free, to invest in this is essential. Slub catchers are better fitted to clear single yarns.

GENERAL SUMMARY

Your machinery is specifically designed to process the short wools available from Ludhiana combers. I am left in no doubt it is mainly a question of careful thought - planning or organisation.

I offer the following for your consideration:-

MIX STYLES:

I have no hesitation in saying that careful and judicous blending will produce results. The combination of which is nearly endless. We have discussed various blends. Trials should be carried out. Further discussion is then possible.

MACHINERY:

It is important that a planned programme is put into operation as quickly as possible. Done in such a way as to minimise losses in production i.e. all parts required should be available, prior to commencing overhaul.

Once this is done an improvement in quality and efficiency should be obvious. The possibility of reducing the labour force should be in the forefront. Waste and sweepings should also be reduced, as should spares and consumables

MATERIAL HANDLING:

Thought should be given to material flow through correct handling. To provide the necessary trolleys - containers etc, would require some investment, but should be re-couped on labour saving and prevention of mistakes, to say nothing of quality. Designs are available on request.

MANAGEMENT CONTROL:

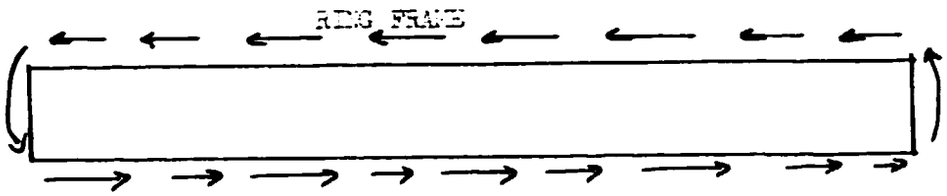
Your spinning master should make the examination of the following daily routine.

1. All drafting rollers - carriers - aprons porcupines - fallers - guides etc.

   Not only does this get him amongst his machinery but it exhibits a concern, which should have an effect on all.

2. Have a planned flow. Everything has an appointed place and must be in it. Your spinning master should virtually be aware of every top - bobbin - cop or hank in the factory.

   Have your spinning master institute a correct system of operative patrolling i.e.



Patrolling should be continuous as shown, without back tracking. Done correctly this will assist in reducing labour - waste etc.

WASTE CONTROL:

Do not gather soft waste and hard waste simply into two separate lots. Have containers for every machine - with waste to be recorded at the end of each shift.

This will assist in pin pointing sources of greatest waste. Further action can then be taken.

LABOUR CONTROL - ACCORDING:

To your spinning master the following is the present status of labour, The target is general in development countries. Labour in the developed world is lower.

To achiece the suggested target you need:-

1. An awareness of your management, that labour costs money. An awareness that labour requires more control than any machine. That excess labour means more trouble.

2. All your machinery in a good and trouble free condition.

3. Correct raw material.

PRESENT				TARGET			
JOB OR FUNCTION	NUMBER REQUIRED	NO. OF SHIFTS	TOTAL	JOB OR FUNCTION	NUMBER REQUIRED	NO. OF SHIFTS	TOTAL
Spinning Master	1	1	1	Spinning Master	1	1	1
Ast. Spg. Master	1	1	2	Ast. Spg. Master	1	2	2
Supervisor	1	2	2	Supervisor	1	2	2
Oiler	1	1	1	Oiler	1	1	1
Electrician	1	2	2	Electrician	1	1	1
Fitter	-	-	-	Fitter	1	1	1
Gill box 1	1	2	2	Gill box 1		2	2
Gill box 2	1	2	2	Gill box 2		-	-
Gill box 3 & 4	1	2	2	Gill box 3 & 4	1	2	2
Reduce/Rov	3	2	6	Reduce/Rov	3	2	6
Spinning	12	2	24	Spinning	4	2	8
Spinner Helper	-	-	-	Spinner Helper	1	2	2
Winding	6	2	12	Winding	6	2	12
Twisting	4	2	8	Twisting	2	2	4
Reeling	2	2	4	Reeling	2	2	4
Packing	2	1	2	Packing	2	1	2
Gate Keepers	3	2	6	Gate Keepers	3	2	6
Peon	1	1	1	Peon	1	1	1
			77				57

Note that I am suggesting a small reduction in labour for Drawing. This should present no difficulty. A much reduced labour in spinning and twisting with machinery in good shape and Strong Management and Supervision, I see no difficulty.

It is my suggestion that one electrician should suffi . The second electrician being replaced by a skilled fitter, who I would regard as more useful.

SPINNING DRAFT:

With the short wools in process I would suggest you may find an advantage in a Reduced Spinning Draft. This should improve yarn levelness, thereby reducing end breaks.

For 1/42 nm the following is suggested, having taken into account the very short drafts used in reducing and roving.

	Sliver input	Doubling	Input	Draft	TOTAL Output	Remarks
1st Gill	20	5	100	4'8	20'5	
2nd Gill	20'5	4	82	5'1	16'0	
3rd Gill	16	2	32	5'3	6'0	
4th Gill	16	2	12	4'0	3'0	Draft from 3'75/
Reducer	3	2	6	4'0	1'5	Draft from 3'76/4'0
Rover	1'5	2	3	4'25	0'7/0'35	
Spinning	0'35	1	0'35	15'21	1/42 NM	Draft from 17'39/15'21

An 'USTER' test on existing drafts can be carried out. Followed by uster tests on new draft if you wish.

UNIT III

A request was received for assistance in drawing up three projects:

a) A Woollen Spinning Unit of 2400 spindles for fine wools and hairs.

b) A Wool Scouring - Carding - Combing Plant.

c) A Worsted Spinning Unit of 5600 spindles. This to incorporate Top Dyeing.

After discussions it was agreed that further thought be given to Projects (a) and (b), before time was spent on drawing up such Projects.

The Worsted Spinning Unit was drawn up and presented together with labour required (excluding management and supervision). Details of Accessories required were also submitted.

PROJECT SHIVALIK WOOLLEN MILLS

TOP DYEING PACKWASHING BACKCOMBING SPINNING ETC

Operation	No of heads or spindles	Rpm or Rpm	Count or Grams	Twist Tpm	Prod @ 100	Efficiency	Expected hourly production	Prod in 24 hrs	Shift req.	Operator per shift	Total operator	Supplier
Ring Spinning	3600	8000	1/36 Nm	480	100	80%	80	1920	3	9	27	Local
Top Dyeing	2 Vessels	--	--	-	100	80%	80	1920	3	3	9	Local
Packwashing	24	5	20 Grams	-	144	60%	86	2064	3	2	6	Fibrotex
De-Felting	1	120	20 Grams	-	144	60%	86	2064	3	1	3	MSC
Melange	1	120	20 Grams	-	144	60%	86	2064	3	1	3	MSC
De-combing	4	--	--	-	100	80	80	1920	3	1	3	MSC
Blender	1	120	20 Grams	-	144	60%	86	2064	3	1	3	MSC
Autoleveller	1	120	20 Grams	-	144	60	86	2064	3	1	3	MSC
Intersector	2	100	12 Grams	-	144	60	86	2064	3	1	3	MSC
Intersector	3	120	6 Grams	-	130	70%	91	2184	3	1	3	MSC
Lm 14 Flyer Rov Spinning	2 x 24 above	100	0'5 Grams	-	144	70	100	2400	3	1	3	MSC
Winding	120	600	1/36	-	120	70%	84	2016	3	6	18	Local
Assembling	80	500	1/36-1/36	-	133	65%	86	2064	3	4	12	Local
Twisting	1000	8000	2/36	250	100	80	85	2040	3	5	15	Local
Reeling	124	400	2/36	-	165	50%	82	1968	3	4	12	Local
											117	Total

UNIT IV

This unit requested assistance on 'Uniflex Spinning Machines' processing all wool top dyed, spun to 1/30^{s} Nm.

A visit was paid to the unit where it was found that this was their first attempt at spinning 100% wool yarn, being primarily acrylic spinners. Examination of the Wool Top being used, left no doubt, that it was in fact a re-processed top with an average fibre length of 49 mm.

The 'Uniflex' is essentially a 'Batch' machine relying for fibre control on the twisted roving, controlled by the traditional flume.

Various suggestions were made to improve the product. Having made it clear that a first class yarn could not be expected from the raw material being processed.

The unit decided that the experiment was not worthwhile and reverted to his acrylic spinning.

APPENDIX XIV

PRODUCTION PLANNING & PROGRESS CHASING

In my view an essential function in any Mill often neglected to our cost, I forsee such a function as very necessary as **spinning creeps up in** production.

It should perform the following functions:

1. Receive quantities ordered from sales.

2. Requisition raw material supplies to cover.

3. Know the capacity of every section and give via sales, a delivery promise.

4. Pass written orders to production departments showing the fibre to be used, the counts and twist required, delivery on cone or hank etc.

5. Keep a record of production submitted daily by all departments.

6. Know at all times the whereabouts of any order and its expected delivery date. This from records and physical observation.

7. See to it as far as possible, that production is planned and delivery promises given, in accord with production department requirements i.e. to turn spinning to all hanking one month and all coning next month, is inefficient. To make all weaving yarns one month and all hosiery yarns next month is equally inefficient. Similarly in the Dyehouse, all cone dyeing followed by all hank dyeing. The best and most efficient use of Plant and Machinery does not happen, it is planned.

8. Keep exact records of all materials delivered to all departments and yarn delivered. Thus determining the loss in every lot.

9. Lias between departments. Keeping all fully informed to achieve smoother running and minimise friction.

10. Supply to Management at anytime an accurate picture of production and progress in general or any particular item.

THE DUTY OF SPINNING MASTER TECHNICAL.

PRODUCTION REQUIREMENT

The following tables suggest a production plan from September 1965 to August 1966: Market requirements are taken into account with monthly production shown in each count and material. In drawing up the plan the following factors have been considered:-

1.1 It is proposed to run until years end with one eight hour shift in Ring Spinning. As required in preparation and 16 hours in post spinning. I would regard this period as one of consolidation and of preparation for increased activity from January 1966 onwards.

1.2 Ring Spinning is now run in and I see no reason why an average spindle RPM of 8000 should not be attainable, provided it is possible to adhere to the present raw material specifications.

1.3 From January through February 1966 it should be possible to increase Ring Spinning from 8 hours to 12 hours. This assumes that urgently required spares for Post Spinning have been made available. Post Spinning should be now in a position to absorb the additional production.

1.4 March 1966 should see 2 x 8 hour shifts in Ring Spinning, at the same time Post Spinning should expand to 24 hour working.

1.5 From April 1965 onwards spinning efficiency should be comfortably around 80 with average spindle speeds up to 8500 RPM. By June 1965 average speed should be around 9000 RPM. I foresee little possibility of attaining the 90 efficiency claimed for Ring Spinning.

1.6 Post Spinning follows two distinct routes:-

a) Schlafhorst Autoconer
Hamel 1st Stage
Hamel 2nd Stage Twisting

b) Hirshburger clip coning
Volkman 2 x 1 twisting

In both routes yarns are electronically cleared.

1.7 An efficiency of 90 on Schlafhorst and Hirshburger should present no difficulty. A minimum of 80 eff., is required from April onwards and whilst I don't see clip coning from spinning tubes increasing beyond 80 , there should be no reason why Schlafhorst could not improve to 70 . Indeed as spinning output, improves, 70% eff., on Schlafhorst is a must if balance is to be maintained.

1.8 An average winding speed of 900 MTS per minute on Schlafhorst and Min. of 500 MTS on clip coning. Again these speeds will only be possible with high quality yarns. As for paragraph 1.2 it is of the utmost importance that raw material parameters are maintained. Quality means productivity.

1.9 An efficiency of 90 on Hamel Stage II twisting is a must. Whatever has to be done to achieve this must be done. With Volkman limited by clip coning output, maximum delivery speed is required from Hamel.

1.10 As spinning RPM and LFP increase a substantial imbalance after April 1985 exists, worsening as yarn count becomes coarser, until such time as more twisting capacity is available. The development of a suitable single yarn, seems to provide the answer.

The foregoing assumes that an adequate power supply is available at all times. All calculations are based on 25 working days per month.

PRODUCTION REQUIREMENT SEPT 1985 - AUGUST 1986

QUALITY	COUNT	SEPT	OCT	NOV	DEC	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUG
100% Wool	2/26	2775	2775	2408	1754	2035	2035	2923	5732	4905	6615	7032	7142)
100% Wool	2/32	5087	5087	2408	1052	1018	1018	2924	4777	4905	8020	11720	13094)
100% Wool	1/42	925	925	2006	2456	4579	4579	5847	6688	4905	4410	3516	2581)
100% Wool	2/48	463	925	1205	1755	2545	2545	2925	1912	1637	2205	1173	1191)
100% Wool	Sub Total	9250	9250	8027	7017	10177	10177	14619	19109	16352	22050	23441	23808
100% Acrylic	2/32 (1/37)	5080	5080	3845	1718	2410	2410	3221	6738	8604	11237	13060	13060)
100 Acrylic	2/48 (1/60)	635	635	962	1718	3615	3615	3221	4493	3688	2810	1632	1632)
100% Acrylic	4/16 (1/19)	635	635	--	--	--	--	--	--	--	--	1633	1633)
100% Acrylic	Sub Total	6350	6350	4807	3436	4025	6025	6442	11231	12292	14047	16325	16325)
	Month Total	15600	15600	12834	10453	16202	16202	21001	30340	28644	36097	39766	40133
Daily Running Hours		8	8	8	8	12	12	16	16	16	16	16	16
Average Spindle RPM		8000	8000	8000	8000	8000	8000	8000	8500	8500	9000	9000	9000
Efficiency Target		70%	70%	70%	70%	70%	70%	70%	80%	80%	80%	80%	80%
Productivity Target		1'2	1'2	1'2	1'2	1'8	1'8	2'0	2'2	2'3	2'4	2'5	2'7
Average Count Nm		1/34'3	1/34'3	1/37'6	1/42'5	1/44'2	1/44'2	1/42'3	1/39'9	1/41'4	1/37'1	1/34'6	1/34'5
Actual 'K' Factor		16'05	16'05	18'42	22'1	23'47	23'47	21'99	19'95	21'27	18'06	16'26	16'28
Expected Kilo's @ 1/40 Nm		12519	12519	11820	11550	19013	19013	23090	30264	30462	32595	32329	32660

All Targets Calculated on 25 Working Days per Month

Total for Year = 282872 Kilo's

POST SPINNING BALANCE SEPT 1985 - AUGUST 1986

MACHINE	40 SHS SEPT	50 SHS OCT	NOV	DEC	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUG	
Schlafhorst Autoconer	12594	15743	14361	12705	12217	12217	19149	24360	23478	30565	32774	33061	)
Daily Running Hours	16	16	16	16	16	16	24	24	24	24	24	24	)
Winding Speed	900	900	900	900	900	900	900	900	900	900	900	900	)
% Efficiency	50	50	50	50	50	50	50	60	60	70	70	70	)
Hamel Twisting Stage 1	15113	15113	13787	12197	11728	11728	18382	22793	22600	24518	26219	26448	)
Daily Running Hours	16	16	16	16	16	16	24	24	24	24	24	24	)
Delivery in MTS	300	300	300	300	300	300	300	300	300	300	300	300	)
% Efficiency	60	60	60	60	60	60	60	70	70	70	70	70	)
Hamel Twisting Stage II	14106	14106	12868	11384	11520	11520	17157	22059	20034	22417	23972	24181	)
Daily Running Hours	16	16	16	16	16	16	24	24	24	24	24	24	)
Delivery in Mts	35	35	35	35	35	35	35	40	40	40	40	40	)
% Efficiency	90	90	90	90	90	90	90	90	90	90	90	90	)
Clip Coning	4198	4198	3829	3386	3257	3257	5106	6496	6260	6986	7491	7556	)
Daily Running Hours	16	16	16	16	16	16	24	24	24	24	24	24	)
Delivery in Mts	500	500	500	500	500	500	500	500	500	500	500	500	)
% Efficiency	50	50	50	50	50	50	50	60	60	60	60	60	)
Volkman 2 x 1 Twisting	5618	5618	5308	4485	4415	4415	7077	7522	7231	8091	8652	8723	)
Daily Running Hours	16	16	16	16	16	16	24	24	24	24	24	24	)
Delivery in Mts	35	35	35	35	35	35	35	35	35	35	35	35	)
% Efficiency	90	90	90	90	90	90	90	90	90	90	90	90	)
Total Kilo's Winding	16792	19941	18190	16093	15474	15474	24255	30856	29738	37551	40265	40617	
Total Kilo's Twisting	19924	19924	18176	15869	15935	15935	26234	29581	27265	30508	32624	32909	
Imbalance Winding/Spin	+1192	+4341	+5356	+5640	- 728	- 728	+3254	+ 516	+1094	+1454	+ 499	+ 484	
Imbalance Twisting/Spin	+4324	+4524	+5342	+5416	- 267	- 267	+3233	- 759	-1379	-5589	-7142	-7224	

ROOM H - 1.1

ROOM H - 1.2

APPENDIX XV

BONUS SCHEME

Following our discussion on the possibility of a Bonus Scheme, once production is seriously commenced, herewith is an outline of my ideas.

1. To be fully effective, I believe, any incentive scheme should include all workers and not just machine operators. The inclusion of departmental management is not advocated, on the grounds that more often than not, departmental managers are the source of information used in bonus calculations.

2. The level of payment will obvicusly be fixed by the responsible, but as a general rule the target is 30% of total earnings.

3. Bonus calculations be done on three monthly basis. This allows time for a particularly good month to be balanced by a bad month and/or conversely.

4. Workers to be entitled to Bonus payment only after completing their first three month period applicable to bonus calculations.

5. Calculations of Bonus to be such as to take into account:-

   a) Production

   b) Quality

   c) Time keeping and attendance

   d) Cost of consumables i.e. Draft aprons - ring travellers - spares etc

   e) Deductions by the Departmental Manager for general behaviour

A General outline of the scheme in practice would be:-

Total Bonus	100
Production	30
Quality	30
Timekeeping	15
Cost of consumables	15
Deductions or Fines	10
	100%

In more detail production would be calculated for each count and twist. To what we might term commercial production.

Commercial Production

i.e. taking 1/32^{S} Nm as an example.

RPM of Spindles	Mins per hr.	Hours per day	No of spindles
5000	60	24	3496
1000	32	420	

Length of Yank Count T.P.M.

3371 Kilo's = 100 calculated production

3033 Kilo's = 90 commercial production = Bonus 30

2865 Kilo's = 85 commercial production = Bonus 20

2696 Kilo's = 80 commercial production = Bonus 12

2528 Kilo's = 75 commercial production = Bonus 6

2359 Kilo's = 70 commercial production = Bonus 5%

Below 70 no bonus payment would be possible.

Note:- The higher bonus payments are graduated in such a way as to encourage maximum effort.

Quality

A good quality control system with all errors contributing to yarn faults, careful analysis and recorded, (the decision to introduce Spinning Master (Technical) should enhance this procedure.)

The Following guidelines are suggested

1)	A complaint from a Customer Bonus loss (or total quality bonus)		30%
2)	A justifiable complaint from a Facility Dept., i.e. Dyehouse - Knitting etc	Bonus Loss	20%
3)	Mixed Yarn	Bonus Loss	30
4)	Dirty or soiled yarn	Bonus Loss	5
5)	Slubby yarn	Bonus Loss	10
6)	Double Spinning	Bonus Loss	5%
7)	Slack twist	Bonus Loss	10
8)	Faulty Piecenings	Bonus Loss	5
9)	Bad Knotting (hand)	Bonus Loss	5
10)	Spiral Yarn	Bonus Loss	5
11)	Other faults	Bonus Loss	5

It is hoped none will be found. Even so we are in a poor state if all faults are found in one period.

Apart from Items 1 - 6 - 3, which means a total loss of Bonus for the period and no. 2 which means a 20 loss, it would not be expected that Bonus loss on quality grounds would be more than 5 - 10 in any period.

TIMEKEEPING

It is always argued here that some latitude should be allowed. I cannot agree. Time is Time. A 5 minute latitude only leads to an argument for 10 minutes.

The only latitude to allow, I would suggest, is 5 days late in the period. Further lateness results in a Bonus loss of

1st day late 3

2nd day late 5

3rd day late 7

At which point all timekeeping Bonus is lost.

On absenteeism 3 days in the three month period could be allowed. The fourth days absence bringing cancellation of the full 15. I think we should not allow ourselves to get caught in the net of justifiable absence.

COST OF CONSUMABLES

This can only be applied after practical experience determines actual cost, say after one years full running.

An amount can then be fixed per quarter. All items obviously cannot be included as some are outside workers control i.e. additives etc. Being totally fictitious if the cost is Rs. 10000 then a saving to Rs. 9000 would bring Bonus 5

a saving to Rs. 8000 would bring Bonus 8

a saving to Rs. 7000 would bring Bonus 15

Any cost over Rs 10000 exclude any Bonus.

DEDUCTIONS OR FINES

Waste is often the responsibility of Management i.e. incorrect Raw Material - bad settings - excessive speed - wrong traveller etc., however, under the heading of Deductions and Fines comes unnecessary waste directly attributable to workers.

1) Failure to seat bobbins and cones correctly

2) Insufficient attention to machine

3) Throwing of packages, and many others.

The heading also covers misdemeanour i.e.

1) Refusing an order from a superior etc.

2) Failure to clean machine and work place according to instructions.

ANNEX No 1

LECTURE DELIVERED TO KNITTING CLUB,
LUDHIANA

PREPARATION OF YARNS FOR HOSIERY INDUSTRY

INTRODUCTION

Many thanks gentlemen for inviting me here this evening. I don't expect you all to agree with my views, especially as some of them may cost money, but they are my views and I take this opportunity of preaching, if you like. Let me say first of all, I am not here to criticise, that requires no effort and not much more intelligence.

However bad we may be (and this is a view which has been expressed) the plain truth is that yarn is being produced and is being sold in very substantial quantities. Likewise the garments produced from that yarn and our industry like any other, is about producing, selling and reaping the profits. A very prominent Yorkshire Textile man remarked not so very long ago - no sooner does a young man get his head into a bale of wool, than he gets his backside into a car.

REQUIREMENTS IN A HOSIERY YARN

As in every other aspect of our business there is more than enough room for a number of opinions, but I think no one can dispute the following - a lofty full handling yarn with sufficient strength to be successfully processed.

We must therefore consider the elements involved.

a) The correct blend of microns and length.

b) The Twist inserted into both singles and twofly.

c) The machinery used to produce it.

Unless we are in the position of having our hands on one or other of the renowned hosiery types i.e. Cheviots - Corriedae - Polwarth X'd etc. We shall surely be blending on two counts, price and handle. Here I think it has to be something no one has yet found a way to make, a 'Silk Purse out of a sows ear'.

There is no way that, however skilful the processing, we can make a good job out of a bad beginning. The **essential** characteristics of the raw material cannot be improved upon.

If we are to succeed therefore the raw material must be chosen with care. It depends on whether we want a yarn - which has been rudely described as something having two ends, or whether we a product of which we can be proud. At the risk of labouring the point, it may be as well to remember here that knitwear, for so long an accessory to fashion, has in more recent times because fashion.

A tremendous scope exists for those with the means and courage to take advantage. Leaving aside the wide range of fancy yarns - blends etc., which are available. It is still the classics together with a good range, which form the heart of the industry.

a) The correct blend

Remaining with wool we find that knitwear consumption is roughly divided as follows:

55 Botany say 19 - 24 micron

30 Shetland say 25 - 31 micron

15 Lambs wool 18 - 20 micron

We see that the % of lambswool is shown to be fairly small (without including the many blends aspiring to that description). Shetland or coarser wools find their outlet in hand knitting and the coarser count range.

The meat of the market is in the 19 - 24 micron range. Again, although I have no actual figures available, the bulk being in the 22/23 micron range. It would appear from available data and referring to Europe, that some 55 is worsted spun and 45 woollen spun. My personal impression, certainly so far as the U.K. is concerned, is that woollen spinning is tending to expand at the expense of the worsted sector.

The criteria to be considered when deciding on ones blend are

a) price

b) spinnability

c) end use

Price is determined by judicious blending, which in many cases is also dictated by the end use.

When it comes to spinnability - nothing is achieved if because of initial cost, spinnability is lost. An increase in ends down - more waste - and/or more floor sweepings, often with a necessity for excessive labour, can be false economy, and last but not least, produce an inferior product. Indeed excessive labour in itself indicates an inferior product.

Of the wool characteristics, it can be said that fibre dia-fibre length are the most important - with crimp having some role to play.

Fibre diameter - determines the number of fibres in a yarn section, at a given count of yarn. It has been known for many year, that a minimum of 39 fibres per X section is required, for what can be called a commercial spin. This of course assumes that all other parameters are met.

A good level roving.

Spinning machinery in good shape.

Correct RH

Different researchers vary the number of fibres required to as low as 36 and as high as 42. Whilst one school of thought argues that with the fibre control exerted by some drafting systems as little as 35 fibres will suffice. Frankly, I have yet to see this in commercial production.

Some examples of the number of fibres per section, for various counts and microns are shown:

Wool Micron	Count Nm	n	Count Nm	n	Count Nm	n	Count Nm	n	Count Nm	n
19	24	110	32	62	40	62	48	55	60	44
20	24	100	32	75	40	50	48	50	60	40
21	24	90	32	66	40	54	48	44	60	36
22	24	81	32	61	40	49	48	40	60	32
23	24	75	32	56	40	45	48	37	60	30
24	24	68	32	51	40	41	48	34	60	27
25	24	63	32	47	40	37	48	31	60	25

Shaded areas show firstly, that the quality is perhaps better than required for the count being spun, unless of course this is required to produce, handle or effect.

Secondly the shaded area on the right shows the limit beyond which it is advisable not to go. It is not to say, a yarn cannot be produced in some cases. Summing up I borrow some words of Dr F F Townend - 'It all depends'.

One example of blending for handle - price spinnability etc is:-

70% 24 micron @ 70 mm
30 21 micron @ 58 mm = 23.1 microns

The permutations are endless depending on the count being spun and handle required. A well known howiery spinner adds 10 slipe wool - claiming it imparts a crispness to the finished product. It has now been shown that whilst an increase in the CV of fibre diameter, may effect spinnability. An increase in CV of fibre length often improves spinnability.

I think enough has been said to show that - price - handle - spinnability can all be enhanced by judicious blending.

THE EFFECT OF TWIST

However costly the blend, however near to meeting all the criteria required, the whole effect can be spoiled by incorrect use of twist.

Single twist - normally in a 'Z' direction, unless requested other wise, is described as the minimum required to give a good spin. Other twists than standard are occasionally requested, but what can be achieved is limited.

Twofold twist - most yarns here in Ludhiana are twofold. The twofold twist taking the 'S' direction. A soft twist is inserted to produce the fullness of handle required. A good guide is 50 - 60% of the singles twist.

we should bear in mind that whilst it is accepted that too much Twist will detract from the full handle required. Too little Twist can leave the yarn unstable, without contributing to handle. It is advisable to check with all blends, until standards are established. Theoretically a yarn with 400 TPM 'Z' 220 TPM 'S' will produce a twofold yarn having 180 TPM 'Z' 220 TPM 'S'. This is not strictly true as singles 'Z' twist tends to be trapped during the twisting process.

Work done some time ago on a $2/24^{s}$ Nm worsted yarn shows the following interesting results:-

COUNT $2/24^{s}$ Nm SINGLES TWIST 400 'Z'

The yarn was twofolded with a range of twists and the yarn diameter carefully measured under a microscope. Tension arrangements during measuring were such as to keep the yarn in a straight condition only.

T.P.M.	T.P.I.	DIA IN MM
140	3'55	0'41
160	4'0	0'44
180	4'56	0'45
200	5'00	0'46
220	5'58	0'48
240	6'0	0'42
260	6'6	0'39

We see an increase in yarn diameter upto and including slightly above the twist balance. With as more twist is applied a sharp decrease towards a leaner yarn.

The results are based on 200 measurements in each case. An experiment repeated at the Knitwear Facility, although on a much smaller scale, indicates similar findings.

Other Factors

Yarn Regularity is an important factor in any good yarn. It has an effect on - End Breaks
Waste
Twist (always runs to thinnest point)
End product

Regularity is of course tied very closely with

Fibre fineness
Fibre length
Drafts and Doubling
Condition and setting of machinery

I do not propose to go into details of U etc., as the instrument is not available to many of us. Suffice it to say that a good yarn can be seen as can a bad one. So far as I am aware 'Uster' testing is always available at the Knitting Facility. In case of need and used judiciously it can be of assistance. We must however, use it to supplement our common sense and not to replace it.

The end result of a good yarn is obvious in its performance in further processing. The gentle treatment meeted out by hand operated machinery is not possible on modern high speed looms and double jersey machines. In such circumstances a poor uneven yarn will fail miserably in performance. Again I say consider the future.

Machinery

Traditionally 2 systems of yarn manufacture used to be available. The Bradford of English system - utilising the longer fibred wools and with a 3% oil content and the French or Continental system, utilizing the shorter wools and dry spun.

What both systems had in common was draft against twist for fibre control which together with upto 2000 doublings, produced the highly prized yarns, older members will remember well.

The Bradford system employing draft against twist, in all processes after the first gill and up to spinning, whilst the French system employed pin control until mule spinning, at which point draft against twist is an essential principle.

Here the fact that twist always runs to the thinnest places - is taken advantage of. As the mule makes its draw - twist is inserted with the thicker places having less twist - drafting is possible as the draw continues. This is a repeated until the draw is complete.

Perhaps until now we have not succeeded in producing a better hosiery yarn than with the French system with the Bradford system a close second.

Some of you may have heard of the Lumbs golden bale. For any who have not - Joseph Lumb of Huddersfield is arguably the worlds finest wool and yarns upto super 100s.

The golden bale award, is awarded annually to the wool grower, who produced the finest bale to be delivered in the previous year. It is interesting to note that Lumbs, although now with up to date machinery, has retained a set of Bradford drawing, with can spinning, for processing the golden bale.

Economic Pressures in the so called developed world have been responsible for the immense development of machinery, in all sectors of our industry. Running at ever increasing speeds, with processing becoming always shorter.

Here in Ludhiana we still find many Bradford systems, still producing a yarn which really cannot be imitated. But what of the future. Replacement will become impossible and you know better than I, what rising wage can do in a labour intensive industry. In the years to come it may well be, modernise or go to the wall.

I did a job for one Gentleman, whose costing system was so simple, he simply totalled the cost and doubled them to find the selling price (I don't accuse anyone here of being so fortunate). In an attempt to put together, what we have seen so far.

a) Inferior raw material leads to increased wastage - excessive labour - higher costs.

b) Machinery on which such materials can be processed - is labour intensive - with low productivity - and will eventually become irreplaceable.

If and when we come to decision time on machinery replacement, the world is our Oyster, with innovative machinery coming from many different sources.

For the hand knitters - we may consider Ring Spinning

Repco

Open End

For finer Yarns - Ring Spinning -

Perhaps fitted with revolving ring - although of arguable benefit.

Hollow spindle

I prefer to keep my comments on some of the modern innovations, out of print.

PEOPLE

In all our deliberations on wool and the machinery - let us not for one moment forget the people involved.

1) Experienced and working management

2) Fully trained supervisors

3) Conscientious and reliable - fully trained operators

4) Enthusiastic attention and service

Training has perhaps not had deserved attention for many reasons. Most training tends to be on the job training which whilst serving a purpose, is not always as efficient as may be desired. Bad habits as well as good points, tend to be perpetuated.

One is given to assume that cost of training, especially to the smaller units, is prohibitive, but given the right spirit, there is no reason why an association of units, should not establish a central training centre, where member firms can call on the centre staff, on a consultancy basis. Thus making it self supporting.

FINALLY - Whatever we make, must be made with confidence

with re-producable skill and

with pride.

Time only limits our discussion.

Thank you.