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DP/ID/SER.A/774
12 November 1986
ENGLISH

ASSISTANCE TO PIDC WOOLLEN TEXTILE MILLS

DP/PAK/85/006/11-02

(R) PAKISTAN

Technical report: Technical assistance to the Harnai Woollen Mills Limited ~~(1st mission)~~*

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

Based on the work of Andrew Z. Sliwerski
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Backstopping officer: A. Eräneva, Agro-based Industries Branch

United Nations Industrial Development Organization
Vienna

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The writer wishes to record, with thanks, his great appreciation of the information, co-operation and help received from Mr. Masrur Hasan Khan, Chairman, Pakistan Industrial Development Corporation (Private) Limited, (PIDC), Karachi; Dr. F.A. Rabbani, Director Finance, PIDC, Karachi; Mr. Z.I. Bokhari, M.A.(Maths)Punjab, Post-grad.Dip. in Econ.Dev. (Canada), Deputy General Manager (Operations), PIDC, Karachi; Mr. M. Mirke, Industrial Development Officer, Agro-Industries Branch, United Nations Industrial Development Organization (UNIDO), Vienna; Mr. L. Leite, Senior Recruitment Officer, Project Personnel Recruitment Section, Division of Industrial Operations, UNIDO, Vienna; and last but not least from Dr. K.S. Stephens, Ph.D., PE, Senior Industrial Development Field Adviser, UNIDO, Islamabad. Without their full support and quick reaction it would not have been possible to start, to continue and to complete the mission.

The writer is indebted to the Chairman and to Dr. Rabbani for their special concern about writer's well being and safety also to Mr. Bokhari for his personal commitment to and interest in the writer's mission. Assistance received from other members of PIDC Staff, Karachi, must be mentioned.

Co-operation and willingness of several employees of Harnai Woollen Mills Limited, during the whole period, from the start to the end of the writer's mission must be acknowledged.

Co-operation - within the framework of the writer's involvement in the matters of in-plant training courses for instructors of fitters and instructors of operatives in the spinning department at Harnai Mills - received from the Textile Industry Research & Development Centre, Karachi, (TIRDC, Karachi) must be recorded.

Thanks are also due to Mrs. M.A. Dean of Ilkley, Great Britain, who had the difficult task of typing a complicated manuscript of this report.

Special thanks are due to Mr. Ch. M. Ashraf Waraich, B.Sc.(Punjab), B.Sc.Tech. (Manchester), A.M.C.T.(Manchester), F.I.Prod.E.(London), Dip. in Econ.Dev. (Naples), the recently-appointed Managing Director of Harnai Woollen Mills Limited, Harnai, (Harnai Mills) for his co-operation and full support.

His management concepts and style, his attitude towards an event of an outside consultant working in a mill that is under his jurisdiction, daily joint rounds of the mill with the writer and joint discussions with the supervisory and technical Staff of Harnai Mills were of significant help to the writer during the last few days of the mission. Mention must also be made of Mr. Waraich's long and frank exchanges of opinions, on all matters concerning Harnai Mills, with the writer which took place daily (outside official working hours) at the mill's Guest House.

TERMS OF REFERENCE

The following comprised the Terms of Reference:

1. Job Description DP/PAK/85/006/11-02/31.7.B dated 21 October 1985
   Received from Mr. M. Minke, UNIDO, Vienna, on 10 January 1986. Reference: Appendix 1.

2. Remit from Mr. Z.I. Bokhari, PIDC, Karachi
   During meetings at PIDC mid-January and at the beginning of April 1986 Mr. Bokhari stated that he wished some other matters to be dealt with which can be summarized as follows:
   i) investigate whether the high cost of production is due to negligence by the management or due to machinery/equipment - Harnai Mills are not able to compete with the private sector,
   ii) investigate whether correct blends and appropriate woollen fabrics are being made - improved quality and finishing, and increased efficiencies can enhance value of the cloth,
   iii) investigate the reasons for the difficulty in selling the existing large stocks of worsted fabrics,
   iv) develop blends and cloth constructions for saleable worsted fabrics - is cloth made by Harnai Mills suitable for light-weight suits and/or national dress (long shirt and trousers)?,
   v) investigate the reasons for customers' complaints about quality of worsted fabrics,
   vi) investigate the desirability of having a cloth designing section at Harnai Mills,
   vii) investigate whether or not personnel is suitable for specific tasks,
   viii) assess technical competence of departmental personnel and suggest steps to be taken to improve their competence, if necessary,
   ix) investigate the reasons why, according to Harnai Mills, only about nine thousand blankets - and not more - per month can be produced,
   x) give some advice regarding establishment of marketing and sales function,
   xi) rehabilitate Harnai Mills' name - Lawrencepur's name "sells" the cloth.

3. Other terms

Of necessity - to find solutions to the existing problems - involvement in the investigation of fundamental matters of management, organization, personnel, maintenance of machinery and buildings, marketing and sales, quantity of output and some aspects of the financial situation at Harnai Mills was undertaken by the writer during the course of the mission. This was reported to UNIDO, Islamabad, and PIDC, Karachi. UNIDO and PIDC gave their approvals.

SYNOPSIS OF THE REPORT

1. Situation between 12 January and 10 April 1986

The then existing top management and most of the supervisory and technical Staff were apathetic and either not interested in introducing changes or not able to make improvements.

Operatives were good but not being either sophisticated or proficient industrial workers, needed more work discipline and much stricter supervision regarding technical aspects of the tasks performed. Young and middle-aged generations were quick and willing to learn when they were shown what tasks were necessary and how to carry them out.

Machines, ancillary equipment, and auxiliary installations, needed a much better maintenance as well as many spare parts. Buildings badly needed repairs and working conditions were very much below the internationally-accepted standards. There was an acute shortage of cash to purchase the essentials to run the mill without stoppages from time to time of the machines. Quality of the semi-finished and finished products was poor, production was slow, the amount of waste that was being made was excessive, and there was an apparent atmosphere of helplessness and indifference throughout the plant and the offices.

"We have no money", "Karachi does not want to give us money", "We need money", "Can you speak to the Chairman?", "Can you give us some funds?" etc. etc. were the typical reactions to questions asked by the writer and to his proposals of any changes. And the writer's replies were "I cannot give you money", "I will speak to the Chairman", "Yes, you need money but there are many things that can be done and changes made without any money from Karachi", etc. etc.

Due to the multitude, complexity and interdependence of the problems, causes and reasons such as

- remote location,
- logistic matters,
- local customs,
- very frequent changes in top management,
- low motivation and insufficient personal involvement by many members of the Staff,
- lack of clearly defined policies and specific guidelines,
- insufficient on-the-floor supervision,
- insufficient work discipline in many instances,
- very old (1928 to 1951), slow-running and poorly-maintained machines, sub-standard ancillary equipment, and lack of the necessary spare parts in the Woollen Section,

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- poor maintenance of the anxiliary installations,
- poor maintenance of the buildings,
- poor electric lighting throughout the mill,
- shortage (from time to time) of the essentials such as raw materials and furnace oil,
- low overall efficiency in every department,
- comparatively low outputs and thus high unit costs,
- many incorrect production techniques,
- many incorrect processing routines,
- poor quality of the semi-finished and finished products,
- lack of appropriate and strict production planning and control, testing and quality control as well as waste control systems,
- non-existence of the marketing, sales and after sales function as such,
- non-existence (up to March 1986) of the cloth styling and designing function,
- very narrow product mix,
- lack (up to March 1986) of in-plant training of operatives and fitters,
- lack of reliable records - or lack of any records - in some areas,
- lack of technical and commercial information for perusal by the Staff,
- shortage of cash

and other accumulated problems, causes and reasons the situation had been deteriorating progressively until it became very grave indeed by the middle of January 1986. The mill was a very "sick mill".

2. Methodology of the mission

The writer expected to find Harnai Mills in a very difficult situation - the discovered, prevailing situation was much worse than his expectations.

After 3 (three) days of in-plant work, the writer decided that - in order to make his mission as far as possible beneficial to Harnai Mills and to PIDC - it was necessary to deviate from the conventional role of a Consultant/Adviser namely to carry out a consulting (diagnostic) survey, to find and analyse the facts, to develop and submit recommendations and, if required, help with their implementation, and then provide follow-up services.

At that stage, finding out the facts, advising and writing reports with many long recommendations would have been useless to Harnai Mills and to PIDC, and of little value to UNIDO, Vienna and Islamabad.

It was necessary to spend nearly all the time on the shop floor and to gradually assume the role of a General Mill Manager actually running the mill

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on a day-to-day basis, without undermining the status and the authority of the then incumbent, foreign-trained Project Manager who was in charge of Harnai Mills, and was known, and referred to, as the Managing Director or Officiating Managing Director.

By discussions with supervisory and technical Staff, by explanations and persuasions - and by occasional discussion with the Project Manager - a gradually increasing involvement in, and influence on, matters concerning Harnai Mills has been achieved - the writer hopes. Without the executive powers or the official authority from PIDC to insist that the necessary changes must be made for the benefit of Harnai Mills it was a slow-moving and up-hill exercise.

3. Situation between 11 and 21 April 1986

After the arrival of the newly-appointed Managing Director the situation at Harnai Mills changed immediately in many ways. Supervisory and technical Staff became much more responsive and interested in changes, and accepted the writer's proposals as a form of "instructions to be carried out". What previously would have taken 3 (three) or 4 (four) weeks to do, or was never done, was accomplished or information supplied within 3 (three) or 4 (four) days. For example, the speed of 19 (nineteen) Okuma looms and 6 (six) Saurer looms was checked jointly with the Deputy Weaving Master and recorded on 13 April 1986; 10 (ten) Saurer looms were jointly examined on the same date; background information necessary for the projections of monthly production in weaving and the required relevant weights of raw materials (requested by PIDC) were prepared jointly with the Deputy Weaving Master on 20 and on the morning of 21 April 1986; loom tuners started work on 16 (sixteen) Saurer looms to make them operational; nearly all Hattersley and Okuma looms were weaving either Khaki overcoating cloth or G.S. blanket cloth; more repairs to the plant floor were being done, etc.

The Managing Director made his daily rounds of the mill jointly with the writer and the writer participated in Managing Director's meetings with the supervisory and technical Staff.

During detailed discussions held outside working hours opinions were exchanged between the Managing Director and the writer on all matters concerning Harnai Mills in the context of the Interim Report, dated Karachi, 5 April 1986. The writer understood that the Managing Director brought some funds from PIDC for purchasing of the essentials such as the additional quantities of raw materials, furnace oil, the most urgently needed spare parts and for payment

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of the most urgent repairs to machinery which had to be done by the outside specialist firms.

It was obvious that the recommended, necessary improvements and/or changes were proceeding at a much quicker pace during the last few days of the writer's recent mission, and would continue to do so in the future, so that Harnai Mills can soon achieve a break even point on manufacturing costs and eventually become a profitable woollen and worsted operation.

4. General comments

Summarizing of both all the improvements and/or changes that were implemented during the writer's recent mission and the many more that are necessary in the future would - in the writer's opinion - not be sufficiently representative of the matters in question. Therefore, detailed information, specific recommendations and final conclusions are stated in various Parts of this report and particularly in:

i) "Summary of principal recommendations",
ii) Part XXX. "3-stage plan to modernize and rehabilitate Harnai Mills",
iii) Part XXXI. "Assistance from the United Nations Industrial Development Organization",
iv) Part XXXII. "Conclusions".

SUMMARY OF PRINCIPAL RECOMMENDATIONS

1. Harnai Mills should continue to exist to provide employment. Harnai Mills should not be privatised but should continue to operate as a state enterprise under the aegis of PIDC.

2. Advice and in-plant practical help in solving managerial, organisational, personnel, technical and training problems should be sought and obtained from UNIDO. Some funds for two scholarships (one for a course in Cloth Structure, Styling/Designing and Cloth Manufacture, and one for a course in Mill Engineering and Services) for persons from Harnai Mills to study in Great Britain should be sought from UNIDO. Airfares and some financial contribution towards the total costs of training abroad the scholarship holders should be provided by the Government of Pakistan or by PIDC.

3. PIDC should give and be seen to give to Harnai Mills financial help in the form of financial grants as follows : about Rs.550,000 (five hundred and fifty thousand rupees) before 21 April 1986 (already given?); Rs.1,000,000 (one million rupees) between 22 April and September 1986; Rs.2,000,000 (two million rupees) between November 1986 and February 1987. All grants should be for strictly defined purposes and most-urgent needs only.

4. Some restructuring of Harnai Mills' debts should be considered.

5. Detailed costings of every type of cloth and blanket should be based on the actual, exact and correct data being supplied by each department of the mill.

6. Harnai Mills should achieve a break even point on manufacturing costs by 30 April 1987, possibly sooner, and should then start on a course leading to profitability.

7. Any overdue payments for blankets or cloths delivered by Harnai Mills should be recovered, without delay, from debtors.

8. "Old" stock of finished worsted fabrics should be sold at realistic prices (without "flooding" the market resulting in depressing the prices of cloths).

9. There should be much more continuity of the professional and high-calibre top management at Harnai Mills than had been the case from 01.01.1968 to 10.04.1986.

10. A 3-Stage Plan (covering period 12 January 1986 to 30 April 1993, split into stages and phases) of modernization and rehabilition should be adopted by PIDC for Harnai Mills and by Harnai Mills to operate accordingly.

11. An appropriate marketing, sales and after-sales function should be established as soon as possible, away from Harnai Mills to penetrate every section of the market.

12. A "carrot and stick" policy should be adopted by the Managing Director of Harnai Mills in running the Mills.

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SUMMARY OF PRINCIPAL RECOMMENDATIONS

13. There should be a certain minimum buffer stock of essentials such as raw materials, furnace oil, diesel oil, spare parts for machines, ancillary equipment, accessories, auxiliary agents, card clothing, etc. The amount of buffer stock should be determined by the weekly or monthly consumption rate.

14. A middle management level should be established at Harnai Mills such as Production Manager or Technical Manager who should be responsible for the effective day-to-day operation of the plant and report directly to the Managing Director.

15. A new line-and-staff structure should be implemented including upgrading and/or rewarding of some individuals. Job Descriptions should be prepared - in consultation with every person concerned - and issued to each employee, at every level, below the rank of Managing Director starting with gardeners, sweepers, peons, helpers and operatives through clerks, foremen, departmental in-charges up to and including Production Manager or Technical Manager.

16. There should be a much stricter on-the-floor supervision by every foreman and the departmental in-charge, particularly with respect to the quality of semi-finished and finished product, quantity of output, amount of waste produced and working practices.

17. Condition of all machines, ancillary equipment, accessories and auxiliary installations should - with a few exceptions - be improved to a very great extent in every department. Maintenance routines (preventive and running) should be devised and implemented. As many machines as possible should be made operational. If necessary, 1 (one) woollen ring spinning frame, 1 (one) woollen mule, 1 (one) or 2 (two) Hattersley looms and 1 (one) or 2 (two) Okuma looms that are not operational and are in worst condition should be cannibalised and the parts should be used to improve the condition of the other machines. All the repairs should be executed expeditiously by the workshops and the departments concerned.

18. Condition of the mill buildings and premises should be improved. All the repairs should be executed expeditiously by the workshops concerned.

19. Lighting in terms of illuminance (general and at working positions) should be improved throughout the plant.

20. Quality of semi-finished product and finished product should be improved in every department. Different type of blending oil and a milling aid should be purchased and used, and blanket cloth should not be dried on the roof of the mill buildings.

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SUMMARY OF PRINCIPAL RECOMMENDATIONS

21. Machinery general utilization should be improved, downtime of the machines should be reduced, output and overall efficiency should be increased and unit cost should be reduced in every department.

22. Production in weaving in terms of the total number of picks inserted during weaving per one calendar month should be increased - before 31 October 1986 - to a minimum of 550% (five hundred and fifty percent) of the January 1986 production expressed in the same terms.

23. Some improved or new production techniques and processing routines should be devised for - and introduced in - every department.

24. Dyeing and finishing departments should be investigated further and improved techniques and routines should be implemented. Large variations in the weights of greasy fabrics and finished fabrics per one linear metre between pieces of the same type of fabric, in percentage shrinkage and in percentage weight loss should be eliminated. Investigations - covering all preceding departments - should be carried out, the causes of variations should be found and the remedies should be implemented.

25. An improved, streamlined and "tailor-made" system of data recording, storage and distribution - with respect to each department and the whole plant - should be devised and implemented.

26. An appropriate, much stricter and "tailor-made" production planning and control system should be devised and implemented with particular reference to balancing attainable outputs with the projected consumption requirements for each department and with the requirements for machines and operatives expressed in terms of working hours. Projections of inputs and outputs for three-months periods should be prepared, updated and submitted by the Production Office - every month, on the same date - to the Managing Director.

27. An appropriate and much stricter testing and quality control system should be devised and implemented. The existing testing equipment should be repaired and/or serviced by the specialists. Testing and quality control laboratory should be enlarged and refurbished.

28. PIDC should purchase for Harnai Mills some additional, modern testing and quality control equipment between February and April 1987. The quoted total cost of that equipment C.I.F. Karachi by seafreight is £21,685 (twenty one thousand six hundred and eighty five pounds sterling).

29. An appropriate, much stricter and "tailor-made" waste control system should be devised and implemented. The amount of waste made recently in every department should be reduced immediately by about 25% (twenty five percent). Further reductions should be aimed at.

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SUMMARY OF PRINCIPAL RECOMMENDATIONS

30. Parameters of currently produced yarns and fabrics should be investigated further and, if necessary, changed with the view to optimum product performance and minimum unit cost.

31. Product mix should be widened gradually. New yarns and fabrics should be developed. Utilization of indigenous wools for other cloths (in addition to blanket cloths) e.g. civilian apparel fabrics, furnishing fabrics, etc., should be investigated.

32. The newly-established cloth styling and designing function should continue to exist. The trainees in cloth styling/designing and in keeping of cloth manufacturing records should continue their in-plant, self-training with guidance, by post, from the writer. Their in-plant training should continue during the writer's possible second mission to Harnai Mills.

33. Old stocks of raw materials and yarns in all the stores should be investigated and assessed with the view to utilizing old stocks for the production of currently made types of fabrics and for the development of new yarns and fabrics.

34. Two instructors of weavers and two instructors of fitters/tuners of looms should be trained - in-plant at Harnai Mills, during November 1986 or during January 1987 - by the instructors from the Karachi-based TIRDC. During 1987 and 1988 similar in-plant training courses in other departments should be conducted by TIRDC's Instructors.

35. A small library containing text books on woollen processes and manuals on machinery should be established. Technical and commercial information on the on-going matters and developments in Pakistan and world-wide should be available at the Mills. Self-education amongst supervisory and technical Staff should be facilitated, encouraged and rewarded.

36. Production flow pattern, material storage and handling, and general house-keeping throughout the plant should be improved.

37. Personnel function and security function should be reorganised and strengthened.

38. Mill premises and houses occupied by the Mills' employees should be connected to the national grid for supply of electricity.

39. Communication links with the rest of the country and long-distance transport facilities available at the mill also liaison between PIDC and Harnai Mills should be improved.

40. Feasibility study to determine the advisability of buying indigenous wools by Harnai Mills directly from the sheep farmers and/or shepherds in the surrounding areas instead of from wool merchants in the commercial centres should be carried out.

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SUMMARY OF PRINCIPAL RECOMMENDATIONS

41. Very old carding machines (1951), woollen ring spinning frames (1951) and woollen mules (1951), cone winders, pirn winders, warping machines and creels, Hattersley looms, Okuma looms and greasy cloth inspection machine should be disposed of. They should be sold to second-hand machinery merchants or spare parts dealers or in the last resort - if there are no offers - they should be dismantled, any useful spare parts put in the General Stores and the rest sold as scrap metal. Good, second-hand, reconditioned, more modern (made say 1978 to 1984) machines and equipment should be bought in Great Britain or in continental Europe. Modern machinery will give better quality and higher quantity of output therefore fewer machines should be purchased. Draft specifications for the machinery to be purchased and for any additional equipment needed as well as the details of the projected investment requirements should be prepared. Re-equipment of the Woollen Section should start during Phase 1 and be completed during Phase 2 of Stage 3 of the 3-Stage Plan to modernize and rehabilitate Harnai Mills.

42. Very old (1928 to 1939) worsted spinning machinery should be disposed of and not replaced. Any worsted yarns that may be required in addition to the yarns produced on the already-installed, modern SACM worsted spinning machinery should be bought on the open market in Pakistan or abroad.

43. In the near future all efforts should be concentrated on the Woollen Section. If at all possible, woollen yarns should not be bought outside on the open market.

44. The re-start of the Worsted Section should be postponed for at least 9 months from the end of April 1986 i.e. until 1 February 1987, possibly longer.

45. Any existing heating, air conditioning, electrical, etc.installations should be re-examined and any additional necessary equipment should be purchased to achieve fully-controlled atmospheric conditions (humidification, air conditioning, heating and ventilation, dust extraction) and good lighting throughout the mill between May 1991 and April 1992, and particularly air conditioning and wall insulation in testing and quality control laboratory.

46. All the mill buildings and offices (mill and administration) should be refurbished between May 1992 and April 1993.

47. Work Study should be conducted in every department of the mill by a well qualified and fully experienced in the wool textile industry Work

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Study Engineer. Work Study should be carried out between January and April 1993.

48. The re-equipped Woollen Section and the improved Worsted Section should be on-stream, the system of fully-controlled atmospheric conditions operational, good lighting system installed, all mill buildings and all offices refurbished and Harnai Mills should be working as a profitable woollen and worsted operation by 30 April 1993, possibly much sooner.

49. In the event of PIDC's decision to dispense with the existing very old machines in the Woollen Section and to purchase more modern, more productive, second-hand, reconditioned machines and some ancillary equipment, PIDC should first carry out a marketing study to determine the market potential for the types and yearly quantities of finished products (and including future possible orders for G.S. blankets, "Rainbow" blankets and Khaki overcoating cloth) so that detailed specifications for the types and the numbers of the necessary machines and the additional equipment to balance production - and to allow for some spare capacity for future expansion - can be prepared.

50. If the laws of the Country and the local customs permit - in order to reduce the unit cost - Harnai Mills should start to operate, as soon as possible, on a 3 (three) shift working system by redeploying the existing personnel also taking into account balancing of production between departments and the building of sufficient (but not excessive) buffer stocks of the semi-finished products. Only additional weavers should be engaged or trained - preferably those who were dismissed when the Worsted Section ceased to operate. Laws and customs permitting, the 3-shift working system should continue after Harnai Mills are re-equipped with the more modern machinery so that the payback period is shortened.

NB: In the case of Harnai Mills every principal recommendation is of nearly equal importance. An attempt had been made to present the principal recommendations in a manner whereby they are grouped together as having some affinity regarding specific areas and as being for consideration specifically by UNIDO, by UNIDO and PIDC, by PIDC, by PIDC and the Managing Director of Harnai Mills, by the Managing Director, by the Managing Director and the supervisory and technical Staff, and the supervisory and technical Staff on their own.

IA. KEY WORDS

United Nations Industrial Development Organization (UNIDO) Vienna, UNIDO Islamabad, United Nations Development Programme in Pakistan (UNDP Pakistan), Government of Pakistan, Baluchistan, Province, Pakistan Industrial Development Corporation (Private) Limited, Karachi, (PIDC, Karachi), Harnai Woollen Mills Limited, Harnai, (Harnai Mills), Textile Industry Research & Development Centre, Karachi, (TIRDC, Karachi), Gija wool, Acrylic soft waste, General Service Army blanket (G.S. blanket), "Rainbow" blanket, Khaki overcoating cloth, metric count of yarn (Nm), English cotton count of yarn (Ne_C), "Harnai-weaving-unit" ("HWU"), Great Britain,
absenteeism, accessory, action, activity, advice, age, agent, airfare, air conditioning, analysis, ancillary equipment, apparel fabric, appendix, applicant, area, arrangement, arrear, assistance, assistant spinning master, atmospheric condition, attendance, authority, attention, auxiliary agent, auxiliary installation, bag, bale, beam, beaming-off, bed of layers, benefit, blanket, blend, blending, bobbin, boiler, boiler house, book, box, break even point, buffer stock, building, burling, calculation, calendar month, candidature, capacity, capital, car, carbonising, card, card clothing, carding, carding machine, cause, certificate, chairman, chemical, cheese, circumstance, cleaning, clerk, client, cloth, cloth designer, cloth setting, cloth styling and designing, club house, "cobwebbing", "cockled" piece, colour, comment, commissioning, communication, comparison, complaint, component, conclusion, condition, consultant, co-operation, continuity, contribution, control, control panel, copyright, cost, costing, count, counter-pile, counting, cover, creel, creeling, customer, data, data recording, debt, decision, defect, degree, delay, delivery, department, departmental in-charge, deputy weaving master, design, designer, designers' blanket, designing, detail, development, devising, difficulty, director finance, dirt, discussion, dispensary, distribution, dobby, doffing, donation, dropper pinning, drop wire, "droppings", dust shaker, duty, dyeing, dyeing vessel, dyestuff, drying, drying chamber, efficiency, electricity, electrical engineer, electrical workshop, employee, emulsion, encouragement, end-use, enterprise, entry, environment, equipment, erection, essential, establishment, evaluation, evenness, experience, fabric, factor, fancy yarn, fault, fearnought machine, feasibility study, fibre, file, finance, financial contribution, financial grant, fineness, finished cloth, finished product, finished width, finishing, floor, fluorescent tube, "fly", foreman, function, fund, furnace oil, furnishing fabric, gaiting, garden, general environment, general mill manager, generation, generator, gramme, greasing, greasy cloth, ground, guest house, guideline, handling, hard waste, heating, help, helper, hopper, house, housekeeping, hydrant, illuminance, illumination, imperial system, implementation, improvement, inch, industry, information, ingredient, innovation, in-plant training, in-plant work, input, inspection, installation, instructor, interaction, interest, in-the-mill working day, interim report, introduction, investigation, investment, involvement, irregularity, item, job, job description, joinery workshop, journal, kilogram, knowledge, knot, knotting, laboratory, labour, lack, law of the country, layer, "layering", lecture, length, level, liaison, library, lighting, line-and-staff structure, link, list, literature, litre, local custom, location, loftiness, loom assignment, loom (conventional), loom (shuttleless), loom inspector, loss, lubricant, lux, machine, machinery, machinery downtime, machinery general utilization, machinery park, machinery setting, magazine, mail of the heald wire, maintenance, management, manager, managing director, man-day, man-month, manual, manufacturing, market, marketing, matter, measuring device, mechanical blending system, mechanical oiling system, mechanical workshop,

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IA. KEY WORDS

"mellowing", mending, merchant, method, methodology, metre, metric system, metric tonne, mill, mill engineering and services, milling, milling aid, mill yard, mission, mixing, modernization, money, motion, motor, need, nylon fibre, oil, oiling, office, on-site mission, on-stream, on-the-floor supervision, operation, operative, order, organisation, ounce, output, overall weaving efficiency, overhaul, parameter, part, payment, payback period, pay-roll, penetration, peon, percentage, perching, performance, person, personal note, personnel, phase, photostat, pick, piece, pile, pipe, pirn, place, plan, planning, plant, point, point paper (design paper), policy, position, potentiality, pound, pound sterling, premises, preparatory to weaving, prerequisite, price, private sector, problem, process, process design, processing, processing routine, product mix, production, production flow pattern, production manager, production technique, profit, profitability, programme, progress, project manager, projection, property, public sector, purpose, qualification, quality, quality control in-charge, quantity, quotation, rag, rag pulling, raising, raw material, reaching-in, reason, recipe, recommendation, record, reed, re-equipment, refurbishment, region, rehabilitation, religion, remark, remedy, remit, reorganisation, repair, report, requirement, resource, responsibility, re-start, ring spinning frame, roof, routine, rpm, rupee, safety, sale, sample, sand, scholarship, scouring, scouring set, scrap, security, self-education, self-training, selvedge, semi-finished product, service, setting, sewing, shaft, shift, shuttle, situation, slub, slubbing, soap, soft waste, snarl, space, spare part, spindle, spindle band, spinning, sprinkler, staff, stage, standard, state enterprise, steam, step, stock, stone, stoppage, storage, store, strategy, structure, study, suggestions box, summary, supervision, supervisory and technical staff, surface, surface cover pile, supplier, supply, sweeper, syllabus, synopsis, system, "tailor-made", tank-wagon, tarpaulin, task, technical manager, technique, technology, temperature, tentering, term, terminal report, test, testing, textile, texture, thread, throughput, thrum, time factor, time-table, title, tool, train, trainee, trainee assistant cloth designer, trainee cloth designer, training, transport, travel, turns per inch (tpi), twist, twister, twisting, "twitty" (uneven) yarn, tying, unit cost, use, utilization, variation, vegetable matter, vehicle, vertically-integrated woollen and worsted mill, volume, ventilation, wall, wage, warp, warp beam, warp stop motion, warp thread, warping, waste, waste pulling, water, weave, weaving, weaving capacity, weft, weft stop motion, weight, weight scale, whipping (sewing), width, "wildness", willow opener, winder, winding, wood, wool, woollen cloth, woollen manufacturing, woollen mule, woollen ring spinning frame, woollen section, woollen spinning, woollen yarn, work, worker, working environment, working hour, works engineer, workshop, work study, worsted cloth, worsted manufacuring, worsted section, worsted spinning, worsted yarn, woven fabric, yard, yarn, yield, allowance, backlog, beam dyeing machine, context, country, decoration thread, definition, expediency, fettling, matter, name, official standards and regulations, polyester, reference, "sloughing off", tolerance, travel rug, uniform cloth, weaveroom, woollen system of yarn manufacturing, woollen-type fabric, woollen-type yarn, worsted system of yarn manufacturing, worsted-type fabric, worsted-type yarn.

IB. INTRODUCTION

1. General remarks

The mission - at the invitation of United Nations Industrial Development Organization, Vienna, Austria (UNIDO, Vienna) - to Pakistan Industrial Development Corporation (Private) Limited, Karachi, Pakistan (PIDC) and to Harnai Woollen Mills Limited, Harnai, Baluchistan, Pakistan, (Harnai Mills), was carried out during January, March and April 1986.

The situation at Harnai Woollen Mills Limited (Harnai Mills) recorded in this report refers to period from 20 January to 21 April 1986 (except February) i.e. the time of the writer's work at Harnai Mills. The changes that took place are stated and further specific recommendations are submitted in the respective Parts of this report and the enclosed Appendices.

The total number of the in-the-mill work days spent by the writer at Harnai Mills was 40 (forty). Reference: Appendix 2.

This Terminal Report supersedes the writer's Interim Report (Draft) prepared at the request of Mr. Z. I. Bokhari, PIDC, at the beginning of April 1986. The Interim Report (Draft - handwritten) was prepared in Karachi and dated 5 April 1986. Photostat copies of the Interim Report were submitted to PIDC, Karachi, and sent to UNIDO, Islamabad and to UNIDO, Vienna. A photostat copy was also given to Mr. Ch. M. Ashraf Waraich, the recently-appointed resident Managing Director of Harnai Mills. The originals of the Interim Report and of the Appendices have been retained by the writer and used in the preparation of this report.

2. Background information

Pakistani wool textile industry comprises two sectors namely the private sector and the public sector.

Harnai Mills are one of the state enterprises within the PIDC. The writer understood that Harnai Mills were established under PIDC in 1953 in accordance with the prevailing Government policy to industrialize the economically-backward areas, and to provide employment in remote and isolated regions where private-sector-industry was not forthcoming. The writer understood that the private sector of the wool textile industry was doing well.

IC. DEFINITIONS OF VARIOUS YARNS AND FABRICS

1. Definitions of the yarns and fabrics that have been - and are likely to be - produced by Harnai Mills

In the context of this Terminal Report the writer considers it as both importart and relevant to define, for reference purposes, the yarns and fabrics that have been - and most likely will be - produced by Harnai Mills.

Woollen yarn

A yarn which has been produced - according to the woollen system of yarn manufacturing (i.e. on woollen carding and spinning machinery) - wholly from wool fibres, new or re-processed, or both. A very small percentage of other fibres that a yarn may or may not contain is subject to the tolerance and allowance specified in the official standards and regulations applying in the individual country.

Woollen fabric

A fabric which has been produced wholly from the woollen yarns. Such a fabric may or may not contain decoration threads (in warp and/or in weft) that were manufactured from other than wool fibres. The total percentage of other than wool fibres in a fabric is subject to the tolerance and allowance specified in the official standards and regulations applying in the individual country.

Woollen-type yarn or woollen blended yarn

A yarn which has been produced - according to the woollen system of yarn manufacturing (i.e. on woollen carding and spinning machinery) - from blend(s) containing wool fibres (new or re-processed or both) and other fibres. The percentage of other than wool fibres in a yarn is subject to the tolerance and allowance specified in the official standards and regulations applying in the individual country.

Woollen-type fabric or woollen blended fabric

A fabric which has been produced wholly from the woollen-type yarns. Such a fabric may or may not contain decoration threads (in warp and/or in weft) that were manufactured from other than wool fibres. The total percentage of other than wool fibres in a fabric is subject to the tolerance and allowance specified in the official standards and regulations applying in the individual country.

Continued ...

IC. DEFINITIONS OF VARIOUS YARNS AND FABRICS

Woollen-type fabric

A fabric which has been produced from cotton warp and woollen weft or from cotton warp and woollen-type weft, or is produced in other similar constructions, is often referred to as a woollen-type fabric. Such a fabric may or may not contain decoration threads (in warp and/or in weft) that were manufactured from other than wool fibres. The total percentage of other than wool fibres in a fabric is subject to the tolerance and allowance specified in the official standards and regulations applying in the individual country.

Worsted yarn

A yarn which has been produced - according to the worsted system of yarn manufacturing (i.e. on worsted spinning machinery) - wholly from combed wool; the wool fibres being reasonably parallel in the yarn. A very small percentage of other than wool fibres that a yarn may or may not contain is subject to the tolerance and allowance specified in the official standards and regulations applying in the individual country.

Worsted fabric

A fabric which has been produced wholly from the worsted yarns. Such a fabric may or may not contain decoration threads (in warp and/or in weft) that were manufactured from other than wool fibres. The total percentage of other than wool fibres in a fabric is subject to the tolerance and allowance specified in the official standards and regulations applying in the individual country.

Worsted-type yarn or worsted blended yarn

A yarn which has been produced - according to the worsted system of yarn manufacturing (i.e. on worsted spinning machinery) - from blended tops (wool and other fibres); all the fibres being reasonably parallel in the yarn. The percentage of other than wool fibres in a yarn is subject to the tolerance and allowance specified in the official standards and regulations applying in the individual country.

Worsted-type fabric or worsted blended fabric

A fabric which has been produced wholly from the worsted-type yarns. Such a fabric may or may not contain decoration threads (in warp and/or in weft) that were manufactured from other than wool fibres. The total percentage of other than wool fibres in a fabric is subject to the tolerance and allowance specified in the official standards and regulations applying in the individual country.

Continued ...

IC. DEFINITIONS OF VARIOUS YARNS AND FABRICS

2. Prevailing situation and recommendations

Due to the time factor the writer was not able to study the official standards and regulations applying in Pakistan concerning the definitions of yarns and fabrics.

In this report therefore, the yarns and fabrics produced by Harnai Mills during the course of the recent mission are referred to by the terms used in Harnai Mills and PIDC, namely "woollen yarns", "woollen fabrics", "worsted yarns" and "worsted fabrics" (when only polyester/wool, etc. was added where relevant to "worsted fabrics") irrespective of the fibre content of individual yarns and fabrics.

However, it is recommended that the classification of the yarns and fabrics produced by the Mills should be in terms which are in accordance with the official standards and regulations applying in Pakistan. And all internal records particularly in connection with cloth styling and designing, also production planning and control should be kept in these terms. Reference concerning all cloth styling and designing records for any one fabric is made in Appendix 70 , and Entry "Fabric: Woollen-type" is in the context of various definitions that are quoted in this Part.

In marketing and selling the terminology that should be used by the Mills should comply with the already established and known procedures in order to make matters easy for the customers providing such a terminology does not conflict with the laws governing manufacturing and selling in Pakistan.

II. PRODUCTS, PRODUCTION, RESOURCES (PLANT, RAW MATERIALS, EMPLOYEES) WEAVING CAPACITY AND MACHINERY GENERAL UTILIZATION

1. Prevailing situation

Harnai mill is a vertically-integrated woollen and worsted mill currently producing only 3 (three) types of woollen cloth namely

i) Blanket cloth for General Service Army blankets (G.S. blanket cloth).
Composition: Woollen warp and woollen weft.

ii) Blanket cloth for "Rainbow" blankets for Pakistan Railways.
Composition: Cotton warp. Woollen weft.

iii) Overcoating cloth (Khaki overcoating cloth) for Police Authorities (Superintendents Police).
Composition: Woollen warp and woollen weft.

Raw materials used: Gija wool (mountain wool), Gija wool (lowland wool), woollen hard thread waste (own) pulled, woollen soft waste (own) (slubbing), acrylic waste (pulled), khaki hosiery (pulled), "Rainbow" woollen hard thread waste (own) pulled, Merino wool II (dyed), Nylon fibre (white) (imported), 2/20 Ne_C cotton yarn (white) and a blend for woollen weft for "Rainbow" blanket cloth.

N.B. Further details concerning blends, yarn and cloth parameters and weights in grammes per one linear metre of finished cloths are given in Appendices 47, 48, 49A, 49B, 50A, 50B, 51, 71, 8 (page 3) and 57.

Woollen Section comprises processes from raw material stage to finished fabric including whipping (sewing) of blankets and warehousing.

Worsted Section comprises processes from top stage (auto-levelling) to finished fabric. Worsted Section was not in operation during the mission and the writer understood that it has not been working since July 1985 due to large stocks of worsted fabrics and no firm orders in hand.

Woollen machinery, worsted machinery and auxiliary installations are listed in Appendix 3.

The total number of employees was 544 (five hundred and forty four). Refe.ence: Appendices 80/1 to 80/15.

Recent total monthly output of each type of woollen cloth in terms of metres of greasy cloth i.e. cloth woven and in terms of picks inserted during weaving is given in Part III. "Recent and the projected attainable before 31 October 1986 monthly production and the projected monthly raw materials requirements for G.S. blanket cloth, "Rainbow" blanket cloth and Khaki overcoating cloth".

Continued...

II. PRODUCTS, PRODUCTION, RESOURCES (PLANT, RAW MATERIALS, EMPLOYEES), WEAVING CAPACITY AND MACHINERY GENERAL UTILIZATION

Woollen Section (processes up to and including weaving, also milling) operated on 2 (two) shifts of $7\frac{1}{2}$ (seven and half) working hours each, 6 (six) days per week i.e. 90 (ninety) working hours per week. The mill was closed on Fridays as holy days.

Working hours	Winter		Summer	
	Shift "A"	Shift "B"	Shift "A"	Shift "B"
Production departments up to and including milling,	07.00-15.00 with $\frac{1}{2}$ (half) hour mealbreak	15.00-23.00	06.30-14.30 with $\frac{1}{2}$ (half) hour mealbreak	14.30-22.30
General shift (all Departmental In-charges and some Foremen), Finishing after milling, General Stores, Chemical Stores, Raw material Stores, Electrical Workshop*, Mechanical Workshop, Joinery Workshop, Warehouses.	08.00-16.00 with meal break		07.30-15.30 with meal break	

* Electrician was on duty from 16.00 to 23.00 hr or from 15.30 to 22.30 hr.

Continued...

II. PRODUCTS, PRODUCTION, RESOURCES (PLANT, RAW MATERIALS, EMPLOYEES), WEAVING CAPACITY AND MACHINERY GENERAL UTILIZATION

2. Weaving capacity

The existing weaving capacity is as given below

Loom made by	Number of looms installed	Fabrics that can be woven at Harnai Mills
Hattersley *	11	Blanket cloths. Travel rugs. Heavy-weight woollen apparel fabrics. Uniform cloths (woollen). Furnishing fabrics (woollen).
Okuma *	28	
Saurer *	20	Cotton warp/woollen weft blanket cloths. Light- and medium-weight cotton warp/woollen weft apparel fabrics. Light- and medium-weight woollen apparel fabrics. Furnishing fabrics (woollen). Medium- and heavy-weight worsted apparel fabrics.
Hattersley *	4	Medium-weight worsted apparel fabrics.
Picanol (shuttleless) (rapier)	6	Light- and medium-weight woollen apparel fabrics. Light-weight cotton warp/woollen weft apparel fabrics. Furnishing fabrics (worsted). Light-, medium- and heavy-weight worsted apparel fabrics. Uniform cloths (worsted).
Total	69	Woollen fabrics: 10 (ten) types. Worsted fabrics: 5 (five) types. Total: 15 (fifteen) types of fabrics can be woven.

* Conventional i.e. shuttle looms

3. Machinery utilization

The level of machinery utilization was very low as can be seen from situations recorded at random and quoted below.

3.1 Various machines standing idle due to lack of a raw material

Acrylic soft waste was one component of a blend for G.S. blanket cloth and as it was not in stock in the Stores and there was a delay in delivery it was not possible to put down a blend consequently

22 January 1986 (Wednesday)

All carding machines
All woollen ring spinning frames
One spinning mule
All winding machines
were not working,

At 17.30 hr only 7 (seven) looms were working.

Continued...

II. PRODUCTS, PRODUCTION, RESOURCES (PLANT, RAW MATERIALS, EMPLOYEES), WEAVING CAPACITY AND MACHINERY GENERAL UTILIZATION

23 January 1986 - all day (Thursday)

All carding machines)
All woollen ring spinning frames) were not working.
One spinning mule)

Only 5 (five) looms were working - times of working were not recorded by the writer.

24 January 1986 (Friday - mill closed)

25 January 1986 (Saturday)

Acrylic soft waste arrived at Harnai Mills by lorry at 11.00 hr.

3.2 Weaving on 30 March 1986 (inspected jointly with the Deputy Weaving Master)

i) Average percentage utilization of all i.e. woollen and worsted 69 (sixty nine) looms installed was 39.13% (thirty nine point thirteen percent). Reference: Appendix 4.

ii) Looms (woollen) weaving

Hattersley - 5
Okuma - 19
Saurer - 3 Total: 27

iii) Looms (woollen) ready to receive warps (woollens)

Hattersley - 5
Okuma - 5
Saurer - not inspected* Total: ?

iv) Looms (woollen) needing many spare parts

Hattersley - 1
Okuma - 1
Saurer - not inspected* Total: ?

v) Looms (woollen) waiting to be overhauled (some parts available)

Okuma - 3
Saurer - not inspected* Total: ?

*Saurer looms were inspected on 22 March and 13 April 1986. Reference: Appendix 8 (pages 1 and 2).

vi) Looms (worsted) not weaving

Hattersley - 4

vii) Looms (woollen and worsted) not weaving

Saurer - 17
Picanol - 6 Total: 23

Continued...

II. PRODUCTS, PRODUCTION, RESOURCES (PLANT, RAW MATERIALS, EMPLOYEES), WEAVING CAPACITY AND MACHINERY GENERAL UTILIZATION

3.3 Spinning on 19 April 1986

Woollen ring spinning frames Nr. 6, 5 and 2 were working,

Woollen ring spinning frame Nr. 4 was ready for working after adjustments were made and settings checked during training of instructors of operatives and instructors of fitters (March-April 1986),

Woollen ring spinning frames Nr. 1 and 3 were not working at any time due to lack of many spare parts,

Woollen spinning mule - 1 (one) working,

Woollen spinning mule - 1 (one) not working at any time due to lack of many spare parts.

III. RECENT AND THE PROJECTED ATTAINABLE BEFORE 31 OCTOBER 1986 MONTHLY PRODUCTION AND THE PROJECTED MONTHLY RAW MATERIALS REQUIREMENTS FOR G.S. BLANKET CLOTH, "RAINBOW" BLANKET CLOTH AND KHAKI OVERCOATING CLOTH

1. Summary of monthly production in weaving in terms of metres of greasy cloth produced from 1 January to 14 April 1986 with respect to each type of cloth

The following production was achieved in weaving working on 2 (two) shifts of $7\frac{1}{2}$ (seven and half) working hours each per 1 (one) day, 6 (six) days per 1 (one) week i.e. $2 \times 7\frac{1}{2} \times 6 = 90$ (ninety) working hours per 1 (one) week.

	January 1986	February 1986	March 1986	April 1986*
i) G.S. blanket cloth	14,123m	15,369m	15,526m	7,261m*
ii) "Rainbow" blanket cloth	862m	749m	529m	203m*
iii) Khaki overcoating cloth	Nil	Nil	2,627m	2,852m*
	14,985m	16,118m	18,682m	10,316m*

*up to 14 April 1986. 2 (two) days' production was lost due to strike on 7 and 8 April 1986.

The above quoted monthly greasy cloth production figures for January, February, March and April 1986 were asked for and received from the Production Office on 20 April 1986.

Reference: Appendices 5 and 6.

2. Calculations and summary of monthly production in weaving in terms of picks inserted during weaving from 1 January to 14 April 1986 with respect to each type of cloth

2.1 Calculations

When producing different types of cloth it was, to a large degree, misleading and not fully representative to compare monthly production only in terms of the total number of metres of greasy cloth (i.e. cloth woven) produced per month because the ratio of the number of metres of each type of cloth within the total sum varied every month.

Furthermore, the number of picks inserted per 1 (one) inch and thus per 1 (one) metre of cloth during weaving was different for each type of cloth. Consequently, the number of picks inserted per 1 (one) metre influenced the total number of metres of greasy cloth produced per 1 (one) month.

The higher is the number of picks inserted per 1 (one) metre of cloth during weaving the shorter is the length of cloth produced during a given length of time - assuming that the cloth is being woven on loom(s) operating at the specific and the same speed (expressed in terms of picks inserted per 1 (one) minute) and at the same overall weaving efficiency.

The different numbers of picks inserted per 1 (one) metre of cloth during weaving were as follows:

i) **G.S. blanket cloth : 12 picks/inch = 12 x 39.37 = 472.44 picks/m
ii) **"Rainbow" blanket cloth: 40 picks/inch = 40 x 39.37 = 1,574.80 picks/m
iii) **Khaki overcoating cloth: 22 picks/inch = 22 x 39.37 = 866.14 picks/m

**Reference: Appendix 7.

Continued...

III. RECENT AND THE PROJECTED ATTAINABLE BEFORE 31 OCTOBER 1986 MONTHLY PRODUCTION AND THE PROJECTED MONTHLY RAW MATERIALS REQUIREMENTS FOR G.S. BLANKET CLOTH, "RAINBOW" BLANKET CLOTH AND KHAKI OVERCOATING CLOTH

Therefore, production in weaving had been calculated by the writer and is shown on the following pages as the total number of picks inserted during weaving per 1 (one) calendar month for each type of cloth separately. Such a method of calculation results in a factual and more representative data being obtained which should be used for the statistical and for comparison purposes of the total monthly outputs from weaving.

i) Picks inserted in G.S. blanket cloth

January 1986 = 472.44 picks/m x 14,123m = 6,672,270 picks say 100%
February 1986 = 472.44 picks/m x 15,369m = 7,260,930 picks say 108.82%
March 1986 = 472.44 picks/m x 15,526m = 7,335,103 picks say 109.93%
April 1986 = 472.44 picks/m x 7,261m = 3,430,387 picks say 51.41%

ii) Picks inserted in "Rainbow" blanket cloth

January 1986 = 1,574.80 picks/m x 862m = 1,357,478 picks say 100%
February 1986 = 1,574.80 picks/m x 749m = 1,179,525 picks say 88.83%
March 1986 = 1,574.80 picks/m x 529m = 833,069 picks say 61.37%
April 1986 = 1,574.80 picks/m x 203m = 319,684 picks say 23.55%

iii) Picks inserted in Khaki overcoating cloth

January 1986 = Nil Nil say 0%
February 1986 = Nil Nil say 0%
March 1986 = 866.14 picks/m x 2,627m = 2,275,350 picks say 100%
April 1986 = 866.14 picks/m x 2,852m = 2,470,231 picks say 108.56%

*up to 14 April 1986. 2 (two) days' production was lost due to strike on 7 and 8 April 1986.

2.2 Summary

	January 1986	February 1986
i) G.S. blanket cloth	6,672,270 picks	7,260,930 picks
ii) "Rainbow" blanket cloth	1,357,478 picks	1,179,525 picks
iii) Khaki overcoating cloth	Nil	Nil
	8,029,748 picks	8,440,455 picks
	say 100%	say 105.11%

	March 1986	April 1986*
i) G.S. blanket cloth	7,335,103 picks	3,430,387 picks*
ii) "Rainbow" blanket cloth	833,069 picks	319,684 picks*
iii) Khaki overcoating cloth	2,275,350 picks	2,470,231 picks*
	10,443,522 picks	6,220,302 picks*
	say 130.06%	say 77.47%*

*up to 14 April 1986. 2 (two) days' production was lost due to strike on 7 and 8 April 1986.

Continued...

III. RECENT AND THE PROJECTED ATTAINABLE BEFORE 31 OCTOBER 1986 MONTHLY PRODUCTION AND THE PROJECTED MONTHLY RAW MATERIALS REQUIREMENTS FOR G.S. BLANKET CLOTH, "RAINBOW" BLANKET CLOTH AND KHAKI OVERCOATING CLOTH

3. Calculations and summary of the projected attainable before 31 October 1986 monthly production in weaving in terms of picks inserted during weaving with respect to all 3 (three) types of cloth. Comparison between the projected attainable production and the recent production

3.1 Calculations

Calculations are based on 50% (fifty percent) overall weaving efficiency taking into consideration all stoppages of looms namely stops for warp changes, stops for replenishing of weft pirns, stops due yarn breakages, stops for mechanical repairs, stops for weavers' personal needs, and stops for prayers. This overall weaving efficiency should be attainable now at Harnai Mills.

Speeds of looms in picks per minute and detailed calculations of the projected attainable production are given in Appendices 7, 8, 9, 10.

3.2 Summary

The following summary is based on weaving working on 2 (two) shifts of $7\frac{1}{2}$ (seven and half) working hours each per 1 (one) day, 25 (twenty five) working days per 1 (one) calendar month i.e. $2 \times 7\frac{1}{2} \times 25 = 375$ (three hundred and seventy five) working hours per 1 (one) calendar month.

Projected attainable utilization of looms	Greasy cloth		Picks per 1 metre	Total picks inserted
25 Okuma looms weaving only G.S. blanket cloth	50,000m	x	472.44 picks/m =	23,622,000 picks
10 Saurer looms weaving only "Rainbow" blanket cloth	7,000m	x	1,574.80 picks/m =	11,023,600 picks
10 Hattersley looms weaving only Khaki overcoating cloth	12,500m	x	866.14 picks/m =	10,826,750 picks
45 (forty five) looms working				45,472,350 picks

3.3 Comparison of production (projected attainable before 31 October 1986 vis-a-vis January 1986)

Total picks actually inserted during January 1986 — 8,029,748 picks say 100%

Total picks that should be inserted per 1 (one) calendar month — 45,472,350 picks which represents 566.30% (five hundred and sixty six point thirty percent) of January 1986 production in weaving in terms of picks inserted during weaving.

Continued...

III. RECENT AND THE PROJECTED ATTAINABLE BEFORE 31 OCTOBER 1986 MONTHLY PRODUCTION AND THE PROJECTED MONTHLY RAW MATERIALS REQUIREMENTS FOR G.S. BLANKET CLOTH, "RAINBOW" BLANKET CLOTH AND KHAKI OVERCOATING CLOTH

4. Calculations and summary of the projected attainable before 31 October 1986 monthly production in terms of metres of greasy cloth, finished cloth and blankets. Calculations and summary of the projected corresponding raw materials requirements per one calendar month.

The writer was requested by PIDC at the beginning of April 1986 to prepare projected corresponding raw materials requirements for G.S. blanket cloth, "Rainbow" blanket cloth and Khaki overcoating cloth.

4.1 Calculations

All calculations were based on:

A. The projected attainable utilization of looms as follows:

i) 25 (twenty five) Okuma looms weaving G.S. blanket cloth,
ii) 10 (ten) Saurer looms weaving "Rainbow" blanket cloth,
iii) 10 (ten) Hattersley looms weaving Khaki overcoating cloth.

45 (forty five) looms working 2 (two) shifts of $7\frac{1}{2}$ (seven and half) working hours each per 1 (one) day, 25 (twenty five) working days per 1 (one) calendar month i.e. $2 \times 7\frac{1}{2} \times 25 = 375$ (three hundred and seventy five) working hours per 1 (one) calendar month.

B. The projected attainable - before 31 October 1986 - 50% (fifty percent) overall weaving efficiency.

4.2 Summary

	Projected greasy cloth	Estimated finished cloth	Estimated blankets
i) G.S. blanket cloth	50,000m	37,500m i.e.	13,500 minimum
ii) "Rainbow" blanket cloth	7,000m	7,000m i.e.	2,900 minimum
iii) Khaki overcoating cloth	12,500m	9,375m	-
	69,500m	53,875m	16,400 minimum

Reference: Appendices 7, 8, 9.

Estimated attainable output of the finished products per one calendar month:	Cloth	Blankets
G.S. blankets	-	13,500 minimum
"Rainbow" blankets	-	2,900 minimum
Khaki overcoating cloth	9,375m	-
	9,375m	16,400 minimum

4.3 Projected corresponding raw materials requirements

The relevant raw materials requirements were submitted to PIDC in the form of photostats of the Appendices as follows:

a) Detailed calculations shown in Appendices 7, 8, 9, 10.
b) Summary of calculations shown in Appendix 11.

Continued...

III. RECENT AND THE PROJECTED ATTAINABLE BEFORE 31 OCTOBER 1986 MONTHLY PRODUCTION AND THE PROJECTED MONTHLY RAW MATERIALS REQUIREMENTS FOR G.S. BLANKET CLOTH, "RAINBOW" BLANKET CLOTH AND KHAKI OVERCOATING CLOTH

5. Recommendations and comments

i) The number of looms assigned to weave each type of cloth can, of course, vary according to orders in-hand. But it is recommended that a minimum of 45 (forty five) looms can and should be employed on 2 (two) shifts at all times. The number of looms weaving a particular type of cloth and the speeds of respective looms determine the required quantities of yarns and subsequently the quantities of specific raw materials that are needed.

ii) When 45 (forty five) looms are working the average percentage utilization of all i.e. woollen and worsted 69 (sixty nine) looms installed is 65.22% (sixty five point twenty two percent). The average utilization of all 69 (sixty nine) looms on 30 March 1986 was 39.13% (thirty nine point thirteen percent) as stated in Part II. "Products, production, resources (plant, raw materials...", Point 3.2 "Weaving on 30 March 1986".

iii) It must be borne in mind that the average percentage utilization of looms and the overall weaving efficiency are 2 (two) criteria each judging a different aspect of the weaving department performance.

iv) Assuming:
1 (one) or 2 (two) Hattersley looms,) are cannibalised to obtain spare
1 (one) or 2 (two) Okuma looms,) parts for the remaining looms,
4 (four) Hattersley worsted looms,) are not working,
6 (six) Picanol (shuttleless) worsted looms,)
14 (fourteen) looms are not working.

Thus:
35 (thirty five) looms (Hattersley and Okuma),) should be working
20 (twenty) looms (Saurer),)
55 (fifty five) looms should be working now on woollen fabrics resulting in 79.71% (seventy nine point seventy one percent) average utilization of all i.e. woollen and worsted looms installed.

v) Every effort should be made to achieve the overall weaving efficiency, on a monthly basis, higher than 50% (fifty percent). It is, of course, much more difficult to increase the efficiency from say 50% (fifty percent) to 55% (fifty five percent) than to increase it from say 20% (twenty percent) to 40% (forty percent). As the percentage of efficiency gets higher and higher, the necessary efforts increase steeply for each 1% (one percent) increase in efficiency.

But after
- the weavers and the loom tuners are in-plant trained,
- the quality of yarn is improved,
- the improved or new production techniques and processing routines are devised and implemented,
- the maintenance of machinery is of a higher standard and the most needed spare parts are in stock readily available,
- on-the-floor supervision of weavers is stricter,
- some buffer stocks of raw materials and semi-finished products are in hand.

the overall weaving efficiency, on a monthly basis, of 60% (sixty percent) to 65% (sixty five percent), on a monthly basis, is attainable and should be achieved with the existing Hattersley, Okuma and Saurer looms weaving woollen cloth.

Continued...

III. RECENT AND THE PROJECTED ATTAINABLE BEFORE 31 OCTOBER 1986 MONTHLY PRODUCTION AND THE PROJECTED MONTHLY RAW MATERIALS REQUIREMENTS FOR G.S. BLANKET CLOTH, "RAINBOW" BLANKET CLOTH AND KHAKI OVERCOATING CLOTH

Disposal of the old looms (Hattersley and Okuma) and the installation of more modern, second-hand, reconditioned looms as well as some ancillary equipment (such as dropper pinning machine, warp tying machine) would permit the overall weaving efficiency, on a monthly basis, of 70% (seventy percent) to 75% (seventy five percent), possibly higher, to be achieved.

vi) Basing it on the in-plant work at Harnai Mills during January, March and April 1986 and on the circumstances prevailing one example of which is given in Part II. "Products, production, resources (plant, raw materials..." Point 3.1 "Various machines standing idle due to lack of a raw material" the writer estimated that the overall weaving efficiency, on a monthly basis - of the then variable number (far below 45) of operating looms - was:
- during January and February 1986: 20% (twenty percent) to 25% (twenty five percent)
- during March 1986 : 30% (thirty percent) to 35% (thirty five percent)
- during and up to 14 April 1986 : 35% (thirty five percent) to 40% (forty percent)

It will be very easy to calculate the actual and exact overall weaving efficiency, on a monthly basis, when the more modern, second-hand, reconditioned looms with pick counters are purchased, installed and are run-in.

vii) Exact, detailed and based on facts calculations should be made to determine which of the 3 (three) types of cloth that was recently being made - and any new type of cloth that may be developed - is the most profitable to manufacture considering the whole manufacturing process, any Excise Duty and despatch charges from raw materials costs to delivery at destination costs and overhead costs. And efforts should be concentrated on securing orders for that type of cloth.

viii) The following easy, short and "tailor made" method of calculating monthly production in weaving is hereunder devised for Harnai Mills and should be used for in-house statistical and comparison of production purposes as expressed in "HWU" and stated in Items (b) and (e) below.

The short method of calculating and comparing of production should be used - in addition to the then existing conventional data showing the total number of metres and kilograms of greasy cloth per month - in cases such as Harnai Mills where the old looms (Hattersley and Okuma) producing woollen cloths do not have pick counters which enable readings of the number of picks inserted to be taken at any desired intervals.

a) Picks inserted per 1 (one) metre of cloth during weaving
- G.S. blanket cloth : 12 picks/inch = 12 x 39.37 = 472.44 picks/m
- "Rainbow" blanket cloth: 40 picks/inch = 40 x 39.37 = 1,574.80 picks/m
- Khaki overcoating cloth: 22 picks/inch = 22 x 39.37 = 866.14 picks/m

b) Therefore equivalent in "HWU"
- G.S. blanket cloth with 472.44 px/m is say 1.000 "Harnai-weaving-unit" of measurement of output from weaving say 1 (one) "HWU",
- "Rainbow" blanket cloth with 1,574.80 px/m is say 3.333 (three point three three three) "HWU",
- Khaki overcoating cloth with 866.14 px/m is say 1.833 (one point eight three three) "HWU".

Continued...

III. RECENT AND THE PROJECTED ATTAINABLE BEFORE 31 OCTOBER 1986 MONTHLY PRODUCTION AND THE PROJECTED MONTHLY RAW MATERIALS REQUIREMENTS FOR G.S. BLANKET CLOTH, "RAINBOW" BLANKET CLOTH AND KHAKI OVERCOATING CLOTH

c) Considering

January 1986 production

- G.S. blanket cloth	14,123m x 1 "HWU"	=	14,123 "HWU"
- "Rainbow" blanket cloth	862m x 3.333 "HWU"	=	2,873 "HWU"
- Khaki overcoating cloth	Nil	=	Nil
			16,996 "HWU"

February 1986 production

- G.S. blanket cloth	15,369m x 1 "HWU	=	15,369 "HWU"
- "Rainbow" blanket cloth	749m x 3.333 "HWU"	=	2,496 "HWU"
- Khaki overcoating cloth	Nil	=	Nil
			17,865 "HWU"

March 1986 production

- G.S. blanket cloth	15,526m x 1 "HWU"	=	15,526 "HWU"
- "Rainbow" blanket cloth	529m x 3.333 "HWU"	=	1,763 "HWU"
- Khaki overcoating cloth	2,627m x 1.833 "HWU"	=	4,815 "HWU"
			22,104 "HWU"

d) Comparison of calculations:
- in terms of the total number of metres of cloth produced in weaving,
- in terms of the total number of picks inserted during weaving (as in this Part, Point 2.2 "Summary"),
- in terms of the number of "Harnai-weaving-units" (HWU") produced in weaving.

January 1986 production
14,985m (say 100%) 8,029,748 picks (say 100%) equivalent to 16,996 "HWU" (say 100%)

February 1986 production
16,118m (say 107.56%) 8,440,455 picks (say 105.11%) equivalent to misleading 17,865 "HWU" (say 105.11%)

March 1986 production
18,682m (say 124.67%) 10,443,522 picks (say 130.06%) equivalent to misleading 22,104 "HWU" (say 130.05%)

April 1986 production
Up to and including 14 April 1986 there were 12 (twelve) working days (1,2,3,5,6,7,8,9,10,12,13,14 April) less 2 (two) days - 7 and 8 April - lost due to strike thus 10 (ten) actual working days. Therefore

G.S. blanket cloth	7,261m ÷ 10 days	=	726.1m per 1 (one) day,
"Rainbow" blanket cloth	203m ÷ 10 "	=	20.3m "
Khaki overcoating cloth	2,852m ÷ 10 "	=	285.2m "

Continued...

III. RECENT AND THE PROJECTED ATTAINABLE BEFORE 31 OCTOBER 1986 MONTHLY PRODUCTION AND THE PROJECTED MONTHLY RAW MATERIALS REQUIREMENTS FOR G.S. BLANKET CLOTH, "RAINBOW" BLANKET CLOTH AND KHAKI OVERCOATING CLOTH

Extrapolating
Considering 26 (twenty six) working days i.e. excluding Fridays and then deducting 2 (two) days of strike i.e. 24 (twenty four) working days. Assuming production in weaving continued until 30 April at the rate and with respect to product mix, and to the number of looms operating being the same as prior to 14 April, the following production should have been achieved in weaving during April 1986.

G.S. blanket cloth	726.1m/day x 24 days = say	17,426mx 1 "HWU"	= 17,426 "HWU"
"Rainbow" blanket cloth	20.3m/day x 24 days = say	487m x 3.333	= 1,623 "HWU"
Khaki overcoating cloth	285.2m/day x 24 days = say	6,844m / 24,757m x 1.833	= 12,545 "HWU"
			31,594 "HWU"

Thus
From above 24,757m say 165.21% of January 1986 production in weaving in terms of metres is misleading

From above 31,594 "HWU" say 185.89% of January 1986 production in weaving in terms of "HWU"

e) "HWU" value for a given type of cloth containing a given number of picks inserted per one inch or per one metre of cloth during weaving

If
"Y" = number of picks inserted per one inch in a given cloth

And
"Y" x 39.37 = "Z" number of picks inserted per one metre in a given clot

Therefore
$\frac{\text{"Y"}}{12}$ = "HWU" value for that cloth

And
$\frac{\text{"Z" number of picks/m}}{12 \times 39.37}$ = "HWU" value for that cloth

And
Any given number of metres of a given cloth x "HWU" value for that cloth =
Total number of "HWU" for a given number of metres of that cloth.

IV. CONDITION OF MACHINES, ANCILLARY EQUIPMENT AND ACCESSORIES, AND THEIR MAINTENANCE. SPARE PARTS REQUIREMENTS

WOOLLEN SECTION AND WORSTED SECTION

General remarks

Good condition of every machine, every piece of ancillary equipment and every accessory is necessary in order to obtain good quality of the semi-finished and finished products, to reduce machinery downtime and to achieve the minimum amount of waste during processing, a higher output, the minimum unit cost and a higher profitability.

In any manufacturing enterprise, good condition of machinery can and should be secured by employing a planned, preventive maintenance programme and by executing quickly the running repairs.

Briefly speaking maintenance of machinery can be classified into 2 (two) categories:

i) preventive maintenance comprising
   - checking at different but clearly specified intervals of time to make sure that all the settings are correct and machinery functions well,
   - general overhauling and replacing of any worn out parts,
   - major cleaning and lubricating,

ii) running maintenance comprising
   - immediate repairing of any machine or equipment when it breaks down,
   - immediate replacing of parts and/or accessories that cannot be repaired,
   - minor cleaning and lubricating.

Prevailing situation

In spite of the fact that in the majority of cases Harnai Mills' machinery is very old, the condition of every machine and piece of equipment can and should be greatly improved through better maintenance (preventive and running). All workshops, particularly Mechanical Workshop should manufacture any spare parts that it is possible to make at the Mills and should help each department in carrying out of major overhauls.

Lack of spare parts has been a major problem for some time and this is a mitigating factor to some extent. Notwithstanding any constraint, it is recommended that a much greater attention should be given to the matter of maintenance by utilizing fully the human and physical (and hopefully financial) resources that are readily available.

A. WOOLLEN SECTION

1. Wool scouring and drying

1.1 Wool scouring set (1953)

The whole set was not in a good condition and should be overhauled. Some spare parts are needed. Reference: Appendix 12.

Continued...

IV. CONDITION OF MACHINES, ANCILLARY EQUIPMENT AND ACCESSORIES, AND THEIR MAINTENANCE. SPARE PARTS REQUIREMENTS

A. WOOLLEN SECTION

1.2 Wool drying chamber (1953)

The whole chamber should be overhauled. Some spare parts are needed. Reference: Appendix 13.

2. Willow opening, dust shaking and waste pulling

2.1 Willow opener (situated behind the General Stores)

This machine should be thoroughly cleaned and rust removed. Damaged parts should be repaired and an overhaul is recommended. Some spare parts are needed. Spare parts requirements should be prepared by the Departmental In-charge during October 1986 and submitted to the Managing Director.

2.2 Dust shaker (situated behind the General Stores)

Comments as for Point 2.1 "Willow opener".

N.B. Area around willow opener and dust shaking machine should be thoroughly cleaned and hosed with water to prevent soil and stones getting into raw material processed thus causing damage to fearnought machines, to card clothing as well as clogging-up of the card clothing and necessitating more frequent stopping of a carding machine for fettling thus reducing output from the carding department.

2.3 Waste pulling/rag pulling machine - Junior Breaker made by Laroche (1976)

During the writer's mission this machine was used for pulling own hard (thread) waste. It is a good machine and was in good condition but minor overhaul is recommended particularly re-setting to eliminate many clusters of unpulled hard thread waste which were still present in the material after pulling. Few spare parts are needed. Reference: Appendix 14.

3. Blending and oiling of blends

Blending and oiling machinery and equipment comprise 2 (two) fearnought machines and cans for hand oiling of blends.

3.1 Fearnought machines (2 machines)

New cog wheels had been put on shafts of delivery rollers during March/April 1986. Cog wheels were made from brass (too soft) due to lack of hard steel. Plates (with holes for oiling) should be made in the Mechanical Workshop and fixed over clamps supporting shafts which were held by straps to prevent jumping out. Switch (controlling supply from mains) on motor was broken - it is dangerous to work without such a switch. Spare parts are needed particularly some new spikes (can

Continued...

IV. CONDITION OF MACHINES, ANCILLARY EQUIPMENT AND ACCESSORIES, AND THEIR MAINTENANCE. SPARE PARTS REQUIREMENTS

A. WOOLLEN SECTION

be purchased in Pakistan). Majority of spikes are in reasonable condition. Both machines should be overhauled. Reference: Appendix 15A, 15B.

4. Carding

Carding machinery and equipment comprise 7 (seven) carding machines, 1 (one) roller-grinding machine, a quantity of condenser bobbins and 1 (one) stand for full condenser bobbins.

4.1 "New" carding machine (one machine made by Torigoe. 1980)

Minor overhauling is necessary but many spare parts were needed, particularly card clothing and condenser rubbing aprons. Reference: Appendix 16.

Bare patches or otherwise damaged card clothing caused uneven web, irregular slubbing, variation in the twist and in the count of yarn, and weak places resulting in frequent piecening during spinning and/or breakages of yarn during winding, excessive number of knots that had to be tied and generally poor quality of yarn. Rubbing aprons were worn out and did not give sufficient rubbing action to produce good slubbing.

Poor quality of yarn resulted in low output from winding and weaving, and the quality of the finished fabric was also affected adversely.

4.2 "Old" carding machines (6 machines made by Okuma. 1951)

Under the circumstances prevailing the maintenance was reasonable but more overhauling is necessary. Many spare parts were needed. Reference: Appendices 17A to 17F.

Some repairs had been done during period January to April 1986 e.g. lattices had been repaired. Other comments as for "New" (Torigoe) carding machine above.

4.3 Recommendations concerning "old" carding machines

i) For immediate implementation

The writer anticipates that it will be very difficult to obtain spare parts due to the age of the machines. It will also be a costly exercise to purchase many spare parts.

In view of the above it is therefore recommended that only a minimum quantity of the most urgently needed spare parts is purchased - or if possible should be made in the Mechanical Workshop - to improve immediately the quality and the quantity of output (in this case slubbing and yarn).

Continued....

IV. CONDITION OF MACHINES, ANCILLARY EQUIPMENT AND ACCESSORIES, AND THEIR MAINTENANCE. SPARE PARTS REQUIREMENTS

A. WOOLLEN SECTION

The advantages gained through improved quality and quantity of output will, in monetary terms, be much greater than a comparatively small cost of purchasing some working materials for the Mechanical Workshop.

N.B. In the case of carding machines the most urgently needed items were card clothing and condenser rubbing aprons.

ii) For long-term implementation

It is recommended that the old machines are disposed of. They should be sold to second-hand machinery merchants or spare parts dealers or in the last resort - if there are no offers - they should be dismantled, any useful spare parts put in the General Stores and the rest sold as scrap metal.

Good, second-hand, reconditioned, more modern (made say 1978 to 1984) machines and equipment should be bought in Great Britain or in continental Europe. Modern machinery will give better quality and higher quantity of output therefore fewer machines should be purchased.

Draft specifications for the machinery to be purchased and for any additional equipment needed as well as the details of the projected necessary capital investment will be prepared and submitted in the Terminal Report after the writer's possible second mission to Harnai Mills.

4.4 Condenser bobbins

Some condenser bobbins were damaged and should be repaired so that they facilitate smooth winding-on of the slubbing.

4.5 Roller grinding machine

A small amount of spares is needed. Reference: Appendix 18.

N.B. Machine should be covered with plastic sheets or pieces of old cloth to prevent damage to rollers and area around the machine should be cleaned up.

5. Spinning

Spinning machinery and equipment comprise 6 (six) woollen ring spinning frames, 2 (two) woollen mules and 1 (one) stand for full condenser bobbins.

5.1 Woollen ring spinning frames (6 frames made by Okuma. 1951)

Only 4 (four) spinning frames were operational.
240 (two hundred and forty) spindles each frame. Spindle pitch 4½ inch.
Ring dia. 76mm. Under the circumstances maintenance was reasonable but many spare parts are needed. Reference Appendices 19A to 19F.

Continued...

IV. CONDITION OF MACHINES, ANCILLARY EQUIPMENT AND ACCESSORIES, AND THEIR MAINTENANCE. SPARE PARTS REQUIREMENTS

A. WOOLLEN SECTION

5.2 Woollen mules (2 mules made by Okuma. 1951)

450 (four hundred and fifty) spindles each mule. Spindle pitch 2 inch. Only 1 (one) mule was operational. Under the circumstances maintenance was reasonable but more overhauling is necessary. Many spare parts are needed. Reference: Appendices 20A, 20B.

5.3 Recommendations concerning woollen ring spinning frames and woollen mules

i) For immediate implementation

a) The purchase of a quantity of good quality spindle band is essential. If hand-twisted strands of cotton yarn are used instead of a proper spindle band to drive the whorls of spindles, uneven twist (inserted during hand-twisting to bind individual threads) and stretching of strands result in the variation of r.p.m. of the spindles and consequently cause unevenness of the twist of yarn that is being spun. The number of turns per inch of the yarn spun varies within one spinning cop and between the cops of one doff. Variation in twist of yarn is one of the reasons for "cockled" pieces and/or variation in the width of the finished fabric. Spindle band is not expensive.

b) In order to alleviate immediately the lack of spare parts it is reluctantly recommended that 1 (one) ring spinning frame and 1 (one) mule that are not operational and are in worst condition should be cannibalised, and the parts should be used to improve the condition of all the remaining machines.

c) Other recommendations are the same as under Point 4.3 "Recommendations concerning "old" carding machines", Item (i) "For immediate implementation".

ii) For long-term implementation

Recommendations are the same as under Point 4.3 "Recommendations concerning "old" carding machines", Item (ii) "For long-term implementation".

6. Winding

6.1 Cheese winders*

6.2 Pirn winders (2 machines made by Schlafhorst)*

*These are very old machines, in bad condition and poorly maintained. Many spare parts were needed, but the condition of the machines should be improved through better maintenance (preventive and running). Reference: Appendix 21.

Continued...

IV. CONDITION OF MACHINES, ANCILLARY EQUIPMENT AND ACCESSORIES, AND THEIR MAINTENANCE. SPARE PARTS REQUIREMENTS

A. WOOLLEN SECTION

6.3 Recommendations concerning cheese winders and pirn winders

Recommendations are the same as under Point 4.3 "Recommendations concerning "old" carding machines", Item (i) "For immediate implementation" and Item (ii) "For long-term implementation.

7. Creeling, warping and beaming-off

Machinery and equipment comprise 2 (two) creels, 2 (two) warping machines with beaming-off, and a quantity of weaver's beams known also as warp beams.

7.1 Creels (2 creels)**

7.2 Warping machines with beaming-off**

**They are very old, in bad condition and poorly maintained. Many spare parts were needed, but their condition should be improved through better maintenance (preventive and running).

7.3 Recommendations concerning creels and warping machines with beaming-off

i) For immediate implementation

a) Creels. They do not have any yarn tensioners which fact results in softly wound warp and its "wavy" surface on the reel of the warping machine. Proper yarn tensioners are expensive and this expenditure is not recommended. But the problem should be alleviated immediately by placing metal washers or flat rings with holes on the porcelain yarn guides to hold down a little the yarn thus providing some tension during unwinding from the cheeses. Metal washers or flat rings with holes, a total of 240 (two hundred and forty) washers for 2 (two) creels, should be bought or made in the Mechanical Workshop. Metal washers were placed on the porcelain yarn guides during March/April 1986 but they disappeared as the operatives took them off saying that they caused some breakages to the yarn if it happened to be weak. With the future improved quality of yarn it is essential that the supervisory and technical Staff should instruct the operatives and make sure that the metal washers or rings stay on the porcelain yarn guides to ensure good and firmly wound warps on the reels and consequently good beaming-off resulting in optimum weaving conditions.

b) Warping machines. Brackets and/or fixtures holding warping reed should be repositioned to permit larger diameter of the warp being wound onto the reel of the warping machine. Such an arrangement will permit 4 (four) cuts of warp instead of the presently made 3 (three) cuts of 45 (forty five) yards length per 1 (one) cut of G.S. blanket cloth warp being made thus

Continued....

IV. CONDITION OF MACHINES, ANCILLARY EQUIPMENT AND ACCESSORIES, AND THEIR MAINTENANCE. SPARE PARTS REQUIREMENTS

A. WOOLLEN SECTION

decreasing the amount of waste and speeding up considerably production in warping and weaving.

The Deputy Weaving Master should discuss the matter of warping machines in detail with the In-charge of the Mechanical Workshop and the alterations should be carried out.

The matter is dealt further in Part VIII. "Production techniques and processing routines (past, newly-implemented, and recommended)", Point 8. "Creeling, warping and beaming-off".

c) Other recommendations are the same as under Point 4.3 "Recommendations concerning "old" carding machines", Item (i) "For immediate implementation".

ii) For long-term implementation

Recommendations are the same as under Point 4.3 "Recommendations concerning "old" carding machines", Item (ii) "For long-term implementation".

8. Reaching-in

Reaching-in frame was in a "medium" condition. It is recommended that consideration is given to purchasing, some time in the future, a good, second-hand, reconditioned reaching-in machine to speed up the operation.

The matter is dealt further in Part VIII. "Production techniques and processing routines (past, newly-implemented, and recommended)", Point 9. "Weaving", Item (i) "Gaiting of warps" and Point 10. "Preparatory to weaving".

9. Weaving

Weaving machinery comprises
11 (eleven) Conventional i.e. shuttle looms (non-automatic) made by Hattersley,
28 (twenty eight) Conventional i.e. shuttle looms (non-automatic) made by Okuma.
20 (twenty) Conventional i.e. shuttle looms (semi-automatic) made in Poland - Saurer licence.
59 (fifty nine) looms.

9.1 Hattersley looms and Okuma looms

They are old looms, in bad condition and were poorly maintained. Spare parts were needed. Reference: Appendices 22 and 23.

These looms did not have ancillary equipment such as warp stop motions and weft stop motions fitted in. These motions facilitate weaving and reduce the number of faults in any cloth during weaving and their lack affected adversely the

Continued...

A. WOOLLEN SECTION

quality and the quantity of output, and the amount of waste produced during weaving. Warp stop motions and weft stop motions are very expensive. For example, the current price of one weft stop motion is about £400 (four hundred pound sterling).

Wooden shaft frames were in bad condition. Metal clips should be used for securing horizontal wires (holding heald wires) to the shaft frames instead of strands of G.S. blanket yarn.

9.2 Saurer looms

They are good, fairly modern (1967) looms in a "medium" condition. Some spare parts may be needed. They had warp stop motions and weft stop motions fitted in, but any missing weft fork blades or prongs should be fitted in (blades or prongs can easily be made in the Mechanical Workshop). There should be at least 4 (four) and never any odd number of rows of drop wires on each loom to eliminate excessive friction by cramming and thus provide good weaving conditions.

The writer will send - during October 1986 - to the Managing Director for passing onto the Deputy Weaving Master, the details of weights and the density of drop wires per 1 (one) centimetre of warp sheet, sizes of eyes in the heald wires, etc. which should be used to obtain optimum weaving conditions according to the types and the counts of yarns that are being woven.

9.3 Recommendations concerning Hattersley looms, Okuma looms and Saurer looms

i) For immediate implementation

a) Condition of all the looms can be quickly and greatly improved through better maintenance (preventive and running) which will result in better quality and higher quantity of output, and less waste of yarn.

b) The Foremen and the Deputy Weaving Master should jointly check what spare parts are lying on shelves in various places and/or are available in the General Stores. Reference: Appendix 24.

c) In order to alleviate immediately the lack of spare parts it is reluctantly recommended that 1 (one) or 2 (two) Hattersley looms and 1 (one) or 2 (two) Okuma looms that are not operational and are in worst condition should be cannibalised and the parts should be used to improve the condition of all the remaining looms.

d) Other recommendations are the same as under Point 4.3 "Recommendations concerning "old" carding machines", Item (i) "For immediate implementation".

Continued...

IV. CONDITION OF MACHINES, ANCILLARY EQUIPMENT AND ACCESSORIES, AND THEIR MAINTENANCE. SPARE PARTS REQUIREMENTS

A. WOOLLEN SECTION

ii) For long-term implementation

a) In view of the age of Hattersley looms and Okuma looms the warp stop motions and the weft stop motions should not be bought.

b) During the writer's recent mission all the looms were weaving with one shuttle only. Better quality of woven fabric can be obtained by employing 3 (three) shuttles thus mixing the supply of the individual picks inserted and attaining a more even fabric. But the difficulty was the lack of weft stop motions which makes it difficult for a weaver to decide when to replenish a nearly empty weft pirn. As soon as the weavers are trained by the TIRDC's Instructor 3 (three) shuttles should be employed for weaving on these looms. The matter of training of weavers is dealt with in Part XVIII. "Self-education, in-plant training and training abroad", Point 4.2 "In-plant training in other departments".

c) Regarding Hattersley looms and Okuma looms recommendations are the same as under Point 4.3 "Recommendations concerning "old" carding machines", Item (ii) "For long-term implementation".

10. Inspection, burling and mending of greasy cloth

10.1 Cloth inspection machine

The machine was old and in bad condition. Viewing glass was broken. It can easily be repaired jointly by the Mechanical and Joinery Workshops. In future, it should be maintained in a better condition than previously.

Measuring device on the machine and the weight scales used in conjunction with the machine should be checked and calibrated so that various management control systems can be meaningful, and costings can be based on the actual and accurate lengths and weights.

It is recommended that some time in the future this machine is disposed of and a good, second-hand, reconditioned cloth inspection machine is bought.

10.2 Burling and mending tables and stools

These were in a very bad condition but can easily be repaired by the Joinery Workshop. New tops for tables are needed to prevent damage to cloth and to speed up pulling over of the cloth that is being burled and mended. New tops will not be expensive.

Continued...

IV. CONDITION OF MACHINES, ANCILLARY EQUIPMENT AND ACCESSORIES, AND THEIR MAINTENANCE. SPARE PARTS REQUIREMENTS

A. WOOLLEN SECTION

11. Milling

11.1 Milling machines

Milling machines were old, in a very bad condition and poorly maintained. Rubberised surfaces of the rollers were worn out. Holes in bare metal rollers were making holes in the cloth that was being milled. Spare parts were needed; the writer understood that these could be obtained in Pakistan and that the Managing Director was going to arrange for the repairs to be done.

The results of milling machines being in very bad condition are described in Part XIII. "Waste control", Point 2. "Prevailing situation", Item (iii), Entries (a) and (b).

11.2 Recommendations

i) A list of spare parts needed should be jointly prepared - during September 1986 - by the Foreman and the Departmental In-charge and submitted to the Managing Director for the necessary action to be taken.

ii) Every machine should be overhauled by the Mechanical and Joinery Workshops and - whenever necessary - damaged parts should be sent away for repairs by the specialist firms.

iii) Future maintenance (preventive and running) of the machines should be of a much higher standard.

iv) Electric motors should be checked and overhauled, if necessary.

12. Scouring

12.1 Scouring machines, water pipes, joints and valves

Scouring machines were old and in poor condition. Spare parts were needed; the writer understood that these could be obtained in Pakistan.

Some leaking water valves were repaired during March-April 1986.

12.2 Recommendations

Recommendations (i), (ii), (iii) and (iv) as under Point 11.2 "Recommendations" above.

Any leaking water pipes, joints and valves should be repaired to prevent waste of any hot and cold water.

Continued...

IV. CONDITION OF MACHINES, ANCILLARY EQUIPMENT AND ACCESSORIES, AND THEIR MAINTENANCE. SPARE PARTS REQUIREMENTS

A. WOOLLEN SECTION

13. Tentering

13.1 Tentering machine

Tentering machine was old and poorly maintained. Some spare parts were needed, particularly guiding pins and brushes. Many guiding pins were worn out or were missing thus causing a cloth that was being dried to slip off the pins inside the drying chamber, and getting dirty and smeared with oil. The writer saw one piece of Khaki overcoating cloth badly stained lying on the floor near the machine.

Missing or short pins also caused the finished cloth to be faulty i.e. "cockled" and/or of uneven width.

13.2 Recommendations

i) The whole tentering machine should be overhauled by the Mechanical Workshop and future maintenance (preventive and running) should be of a much higher standard.

ii) Electric motor should be checked and overhauled, if necessary.

14. Dyeing (loose stock dyeing and piece dyeing)

15. Finishing (wet and dry - other than milling, scouring and tentering)

16. Whipping (sewing) of blankets

14.1) 15.1) 16.1) Dyeing vessels, wet and dry finishing machinery (other than milling, scouring and tentering), sewing machines, and the relevant equipment

Due to the time factor the writer was not able to check thoroughly the above mentioned machinery and equipment. But it appeared that some machines needed overhauling or repairs, particularly raising machine.

14.2) 15.2) 16.2) Recommendations

i) The Foremen and the Departmental In-charges concerned should jointly check the condition of every machine and prepare - during October 1986 - a list of spare parts necessary for each machine and submit the lists to the Managing Director for the necessary action to be taken. Prior to submitting the lists availability of any spare parts in the General Stores and in the workshops should be checked.

ii) Any necessary overhauls or repairs should be done by the workshops concerned.

Continued...

IV. CONDITION OF MACHINES, ANCILLARY EQUIPMENT AND ACCESSORIES, AND THEIR MAINTENANCE. SPARE PARTS REQUIREMENTS

B. WORSTED SECTION

1. "Old" worsted spinning, doubling, winding and fancy twisting

1.1 Machines from can gill to cap spinning frame and doubling machine

These machines are very old (made between 1928 and 1939) and in a bad condition. Many spare parts are necessary. Reference: Appendix 25.

1.2 Cone winder - made by Thomas Holt Ltd., England

Old machine. Requires overhauling and many spare parts. Reference: Appendix 26.

1.3 Recommendations

The writer had discussions during February 1986 with a Textile Machinery and Engineering Company in England specialising in second-hand machinery and spare parts. Jigs will have to be made before manufacturing any spare parts for these machines and it will therefore be a very expensive exercise.

It is therefore recommended that the existing very old (1928 to 1939) worsted machines should be disposed of and not replaced. They should be sold to second-hand machinery merchants or to spare parts dealers or in the last resort, if there are no offers, they should be dismantled, any useful spare parts put in the General Stores and the rest sold as scrap metal.

There will be future requirements for worsted yarns for:

a) Picanol shuttleless looms,
b) Hattersley worsted looms, if these can be made operational - reference is made in this Part under Point 4.2 "Conventional i.e. shuttle looms",
c) Some Saurer looms (shuttle looms), if it is decided to increase considerably the production of worsted cloth.

If the already-installed modern SACM worsted spinning machinery is inadequate to satisfy the total worsted yarn consumption requirements, then it will be more profitable to buy the additionally required worsted yarns on the open market in Pakistan or abroad.

1.4 Twister for fancy yarns

It is a fairly modern machine but many spare parts are required which, the writer anticipates, can be purchased without great difficulties.

*List of spare parts required should be prepared during October 1986 by the Foreman and submitted to the Managing Director for future reference. Prior to submitting the list the Foreman should check what spare parts are lying around in various places and/or are available in the General Stores.

Continued...

IV. CONDITION OF MACHINES, ANCILLARY EQUIPMENT AND ACCESSORIES, AND THEIR MAINTENANCE. SPARE PARTS REQUIREMENTS

B. WORSTED SECTION

2. "New" worsted spinning

2.1 Machines from Rapid Draw Frame (auto-leveller) to cone winder

Machines are very good and modern (made by SACM. 1975). They appear to be well maintained but must be covered with plastic sheets or pieces of cloth for protection against dust and dirt.

*List of spare parts required ... as in Point 1.4 "Twister for fancy yarns" above.

N.B. Rain was pouring on some machines - roof should be repaired in many places. Reference: Appendix 31.

3. Pirn winding and warping

3.1 Pirn winder**

3.2 Warping machines** (one of the machines made by Gusken)

3.3 Warping creels**

**Each is in a reasonable condition. Maintenance (preventive and running) should be improved. Some spare parts are needed.

3.4 Recommendations

List of spare parts required should be prepared jointly by a Foreman in weaving and the Deputy Weaving Master during October 1986 and submitted to the Managing Director for future reference.

4. Weaving

4.1 Shuttleless looms (rapier type) - 6 (six) looms made by Picanol

Very good looms in a very good condition and well maintained. During March 1986 these looms have been covered with pieces of cloth for protection.

4.2 Conventional i.e. shuttle looms - 4 (four) looms made by Hattersley

These old looms were in a very bad condition and poorly maintained - it is doubtful if they can be made operational.

4.3 Recommendations

i) As Point 3.4 "Recommendations",

ii) Prior to submitting to the Managing Director the lists of the spare parts required the Foreman in weaving and the Deputy Weaving Master should jointly check what spare parts are lying on shelves in various places and/or are available in the General Stores.

Continued....

IV. CONDITION OF MACHINES, ANCILLARY EQUIPMENT AND ACCESSORIES, AND THEIR MAINTENANCE. SPARE PARTS REQUIREMENTS

B. WORSTED SECTION

iii) Subject to a further detailed inspection of the Hattersley looms during the possible second mission to Harnai Mills it is tentatively recommended that these looms should be disposed of i.e. sold to second-hand machinery merchants or spare parts dealers. Or in the last resort they should be dismantled, useful spare parts put in the Stores and the rest sold as scrap metal.

5. Piece Dyeing

5.1 Beam dyeing machine - made by CDB europ, France (1976)

Modern and good machine and its maintenance was reasonable. The writer was told that this machine can accommodate a beam containing about 300 (three hundred) yards of cloth but Harnai Mills were able to dye only about 50 (fifty) yard lengths on one beam, otherwise dyeing was uneven. Dyeing of short lengths is uneconomical. Furthermore, there is always a danger of some shade variation, however small, between individual dyeing lots. The shorter is the length of cloth the greater is the number of individual dyeings needed to complete one order, and therefore the higher is the risk of a possible shade variation between individual lengths of cloth. Impeller was examined by the writer and it appeared that it was worn out and may have to be replaced. The writer spoke on the telephone during February 1986 with Mr. H. Duchaussoir of Texinox Callebaut De Blicquy, 206 Rue Jean Jaures, P.B. 601, 59656 Villeneuve D'Ascq, France (previously CDB europ) asking for a catalogue of spare parts, operating and service manuals, but these had not arrived at Harnai Mills during the recent mission. In the event of the second mission the writer will contact Texinox again, in advance, and bring the documentation that is needed so that further investigations and dyeing trials can be carried out to solve the problem. In the meantime, a list of spare parts that may be needed for the machine should be prepared during October 1986 by the Foreman in dyeing, and submitted to the Managing Director for future reference.

5.2 Control panel for beam dyeing machine - made by Groux Constructeurs, France

Modern and good equipment, and its maintenance was reasonable.

In the event of a second mission, performance of the control panel will be checked. The same recommendations are submitted regarding list of spare parts for the control panel as for the beam dyeing machine above.

6. Finishing (wet and dry)

Due to the time factor the writer was not able to check thoroughly every machine in the finishing department during the recent mission. It is therefore recommended that the Foreman in finishing and the Departmental In-charge should jointly check the condition of each machine and prepare - during October 1986 - a list of spare

Continued...

IV. CONDITION OF MACHINES, ANCILLARY EQUIPMENT AND ACCESSORIES, AND THEIR MAINTENANCE. SPARE PARTS REQUIREMENTS

B. WORSTED SECTION

parts necessary for each machine and submit the lists to the Managing Director for future reference. Prior to submitting the lists availability of any spare parts in the General Stores and in the Workshops should be checked.

7. Recommendations and comments concerning the re-start of the Worsted Section

Comments concerning worsted machinery have been given in this Part under Points 1 to 6.

It is recommended that all efforts in the immediate future should be concentrated on the upgrading of the Woollen Section and the rehabilitation of Harnai Mills' name should be limited - for the time being - to the area of woollen fabrics.

The writer understood that the Worsted Section has not been in operation since July 1985.

After the changes are made and improvements implemented in the Woollen Section Harnai Mills will have gained self-confidence, improve their reputation and employees at all levels will gain additional experience in production planning, quality control, machinery maintenance, stricter on-the-floor supervision and generally in producing fabrics of higher standards. Plant (lighting, buildings, material flow and handling, etc.) will have also been improved in due course.

The re-start of the Worsted Section should therefore be postponed for at least 9 (nine) months from the end of April 1986 i.e. until 1 February 1987, possibly longer by which time the Mills should be in a "much better state" in every respect.

An earlier re-start would - in the writer's opinion based on work at Harnai Mills - result in the production of sub-standard fabrics, late deliveries and would incur financial losses. Harnai Mills as a worsted cloth producing unit is not yet ready for the re-start of comparatively very sophisticated activities such as worsted yarn manufacture, worsted cloth manufacture and worsted finishing.

Judging from several samples of various worsted fabrics received from Mr. Z.I. Bokhari during January 1986 contaminated yarns (dirty yarns, black fibres in white yarns), uneven yarns, uneven twist of yarn, faults originated during weaving, etc. constituted very serious problems.

Further proof of the problems that existed during worsted cloth production in the past are the photostats of photostats of correspondence received from Mr. Malik Sultan Mahmood, M.A., L.LB, Advocate, High Court, Quetta. The writer met Mr. Sultan Mahmood in Quetta on 18 January 1986 on the way from Karachi to Harnai Mills and was told that he was acting as legal adviser on behalf of Harnai Mills. Reference: Appendices 27A to 27I.

Continued...

IV. CONDITION OF MACHINES, ANCILLARY EQUIPMENT AND ACCESSORIES, AND THEIR MAINTENANCE. SPARE PARTS REQUIREMENTS

B. WORSTED SECTION

Mr. Sultan Mahmood also showed a clearly visible defect in the cloth made up as the front part of the national dress that he was wearing which - the writer was told - was made from Tropical Suiting, Quality "A" costing Rs.70 (seventy rupees) per metre ex-mill. The defect appeared to be a thick slub or a "double end". It could have been a "spinning double", slack yarn or a snarl in the yarn - it was not possible to precisely determine the defect because of unsuitable lighting conditions.

V. CONDITION OF WORKSHOPS, AUXILIARY INSTALLATIONS, WEIGHT SCALES, MEASURING DEVICES, AND THEIR MAINTENANCE

Prevailing situation and recommendations

Generally speaking the condition of workshops, auxiliary installations, weight scales and measuring devices is not as good as might have been expected of facilities erected in 1953. Greater attention should have been given in the past to the repairs and the maintenance (preventive and running). But with more involvement and personal interest of some persons directly concerned, and some comparatively small, immediate financial help from PIDC the situation can easily be remedied.

1. Electrical Workshop

Electrical Workshop has been doing a "very good job" and quickly under the prevailing difficult circumstances, particularly before March 1986 when - the writer was told - men were bringing their own tools from home. More space is needed for this workshop and it is recommended that larger and centrally-located accommodation is found. This would involve major changes and re-allocation of space within one of the mill buildings. Such an exercise should be postponed until phase 2 (two) or 3 (three) of Stage 2 of the 3-Stage Plan for Harnai Mills.

Some additional equipment is needed in addition to tools and equipment brought from England at the beginning of March 1986 and a list of the equipment needed should be prepared and submitted by the Electrical Foreman during October 1986 to the Managing Director in view of the fact that maintenance of machinery throughout the mill should be improved.

2. Mechanical Workshop

Mechanical Workshop appears to be performing satisfactorily under the circumstances prevailing but the jobs undertaken for various departments should be executed quicker. Metal filing cabinet sent from the Stores should be repaired and sent to Designing Office. A list of additional equipment that may be necessary should be prepared and submitted by the In-charge during October 1986 to the Managing Director in view of the fact that maintenance of machinery throughout the mill should be improved.

3. Joinery Workshop

Comments as for Mechanical Workshop.

There is a shortage of wood at Harnai Mills and it is recommended that a search of all the mill premises is made to find pieces of wood and old boxes that are not in use. Pieces of wood and old boxes should be stored in the Joinery Workshop and used for any necessary repairs throughout the mill.

Continued...

V. CONDITION OF WORKSHOPS, AUXILIARY INSTALLATIONS, WEIGHT SCALES, MEASURING DEVICES, AND THEIR MAINTENANCE

4. Water Supply Installation

Water supply installation i.e. tanks, pumps, etc. had not been investigated by the writer due to the limited period of stay with Harnai Mills. But it was noted that the maintenance of pipes, joints, and valves in milling, scouring and dyeing departments needed to be greatly improved. Large leaks had been stopped and some valves in milling/scouring had been repaired during March 1986. A list of any parts and/or equipment that are needed should be prepared and submitted by the In-charge during October 1986 to the Managing Director.

5. Steam Supply Installation

5.1 Existing, old Boiler House

The existing, old boiler house and the network of steam pipes throughout the plant had not been investigated by the writer due to the limited period of stay in Harnai.

5.2 Already-installed, new boiler and new Boiler House

The already-installed new boiler and the new boiler house (located near the existing, old boiler house) should be made operational, as soon as possible, because a regular, ample and cheap supply of steam is vital to Harnai Mills. A list of any parts and/or equipment that are still needed should be prepared and submitted by the In-charge during October 1986 to the Managing Director.

6. Electricity Supply Installation

Due to the time factor the writer was not able to check electrical installations and individual motors but noted that any necessary repairs and/or fittings were carried out quickly by the Electrical Workshop within the limits of readily available resour s. Lighting in the mill has been checked and is dealt with under Point 7. ' ghting systems throughout the mill" that follows.

6.1 Power House

Power House appeared to be well maintained and performed well under the circumstances prevailing. The writer was told that one generator needed to be repaired/overhauled. A list of spare parts needed in the Power House should be prepared and submitted by the In-charge during October 1986 to the Managing Director. There were parts of one generator lying in the scrap yard next to the General Stores and the writer understood that these parts could easily be assembled and the generator could be sold with profit, if some little cash was available for spare parts.

Continued....

6.2 Supply of electricity to the Mills Colony's houses and to the Guest Houses

During the writer's stay in Harnai - and presumably at all times to save power - the electricity to the Mills Colony's houses and the Guest Houses was, as a rule, only supplied during mill-working hours. And from about 18.00 hr to 23.00 hr on Fridays up to the date of the arrival of the newly-appointed Managing Director. After 10 April 1986 the supply of electricity continued for some hours after 23.00 hr.

6.3 Connection of all Harnai Mills premises to the national grid

Some funds (deposit payable to WAPDA, additional equipment, etc.) were needed from PIDC for the connection of the plant, Administration Offices, houses in the Mills' Colony, Club House, Dispensary and Guest Houses to the national grid which should be effected as soon as possible. Details of all the relevant requirements should be prepared and submitted by the Electrical Foreman to the Managing Director.

7. Lighting systems throughout the mill

7.1 Daylight lighting

Generally speaking the daylight lighting was adequate. It can be improved by a thorough cleaning of all windows at regular intervals say once every 3 (three) months.

7.2 Artificial i.e. electric lighting

Electric lighting system was not up to standard for a number of reasons. The level of illumination throughout the plant was low and should be improved.

7.3 Electric lighting installation. Fittings. Illuminance (general and at working positions)

Most of the fittings were positioned too high to give a good level of illumination. Many fluorescent tubes were missing.

It was apparent that the illuminance (general and at working positions) was very much below the generally accepted standards for woollen mills and worsted mills.

Because of very low illuminance the operatives, and the supervisory and technical Staff, were not able to maintain - even after consideration of the other prohibitive factors - the necessary standards of performance, the quality of product and the quantity of output.

Therefore, the illuminance was measured in lux - jointly by the writer and the Electrical Foreman - on 27 March 1986, between 19.00 and 22.00 hrs, in all departments from blending to burling and mending of greasy cloth. Reference: Appendix 28.

Continued...

V. CONDITION OF WORKSHOPS, AUXILIARY INSTALLATIONS, WEIGHT SCALES, MEASURING DEVICES, AND THEIR MAINTENANCE

The salient points were:

- in many places light came from 2 (two) different sources i.e. fluorescent tube and conventional electric bulb - such situations should be eliminated,
- in many instances passageways were well lit e.g. 200 (two hundred) lux or 300 (three hundred) lux at the level of average man's height and at working positions the illuminance was as low as 50 (fifty) or even 0 (zero) lux. For example in carding, surfaces of the rotating rollers and the processed material were in darkness whilst passageways had much better lighting; in weaving, at the point of drawing a piecened thread through the reed in a loom, the illuminance was in some cases only 25 (twenty five) lux or 50 (fifty) lux, and the passageways had illuminance of 100 (one hundred) to 250 (two hundred and fifty) lux,
- all the fittings were too high, particularly when many fluorescent tubes were missing or faulty throughout the mill,
- shadows were often cast on working positions.

7.4 Recommendations concerning electric lighting system

The writer has no formal qualifications in Electrical Engineering but in view of the requirements for the increased production, better quality of product, and personnel improved performance, it is recommended that the whole electric lighting system should be improved in every respect. The actual figures in lux representing the illuminance (general and at working positions) at Harnai Mills should be much nearer to those listed in Appendix 29.

Improvement of the electric lighting system at Harnai Mills will be a costly and lengthy but absolutely necessary exercise. In this context it is recommended that the improvement is implemented in 2 (two) steps as follows:

Step 1 (as soon as possible)

- insides of all shades covering fluorescent tubes should be cleaned and painted white throughout the mill. A large tin of white paint and a paint brush were deposited by the writer in the General Stores during the second half of April 1986,
- Electrical Foreman should submit an updated, detailed list of fluorescent tubes and ancillary equipment needed for the whole mill to the Managing Director during October 1986. Fluorescent tubes and ancillary equipment required as of 1 February 1986 are stated in Appendix 30.
- fluorescent tubes and ancillary equipment that are still needed should be purchased and installed without delay.

Continued...

V. CONDITION OF WORKSHOPS, AUXILIARY INSTALLATIONS, WEIGHT SCALES, MEASURING DEVICES, AND THEIR MAINTENANCE

Step 2 (during Phase 2 of Stage 2 of the 3-Stage Plan for Harnai Mills i.e. during the writer's possible second mission to Harnai Mills)

- checking and recording of illuminance (general and at working positions) throughout the mill starting from the milling department,
- lowering or re-locating of all fittings to bring the source of light nearer to working positions throughout the mill to obtain better illuminance. The writer understood that there were about 1200 (one thousand and two hundred) metres of conduit pipe in the General Stores. This conduit pipe should be saved for the purpose of extending or making new fittings.
- installing fittings in the pits under condenser part of every carding machine,
- installing of any necessary, additional fittings throughout the mill.

8. Weight scales and measuring devices

Correct and precise readings of weights and lengths are necessary for effective production planning and control, quality control, and waste control in order to maintain maximum possible output, good quality of product, minimum unit cost and to obtain true costings of the semi-finished and finished products.

The writer did not have time to check every weight scale and measuring device but it is recommended that every weight scale and measuring device, in every department, should be serviced and calibrated by the respective specialists at regular intervals recommended by the makers.

9. General recommendations concerning maintenance

It is recommended that in order to speed up the execution of the necessary repairs and improve future maintenance of all workshops, all auxiliary installations, all weight scales and measuring devices one person should be appointed to be the Works Engineer.

This matter is further referred to in Part XV. "Personnel", Point 3. "Recommendations concerning transfers, upgrading and/or rewarding", Item (iii).

VI. CONDITION OF MILL BUILDINGS, MILL YARD, HOUSES IN THE MILLS' COLONY, CLUB HOUSE, DISPENSARY, GUEST HOUSES, AND THEIR MAINTENANCE

Prevailing situation and recommendations

1. Mill buildings

Mill buildings are adequate for the recent volume of production and are spacious enough to accommodate additional machinery when it is decided to increase and vary production to some considerable extent. But some relocation of machinery will be necessary in the future before increasing capacity and widening the product mix.

Generally speaking the condition of mill buildings, houses in the Colony, Club House and Guest Houses is much worse than might have been expected of facilities erected in 1953. Greater attention should have been given in the past to the repairs and the maintenance (preventive and running). But with more involvement and personal interest of some persons directly concerned, and some comparatively small, immediate financial help from PIDC the situation can easily be remedied.

1.1 Damaged and missing roofs

i) Roof over the main building

Roof over the main building housing departments from blending to finishing is damaged in many places. Repairs to the roof should be treated as a matter of great urgency. Water is falling on materials, on machinery and on the floor, in many places, when it rains affecting adversely raw materials, production and machinery. New and expensive machinery in the "new" worsted spinning is very badly affected. Premises were inspected by the writer together with the Electrical Foreman on 22 March 1986 at 15.30 hr when it rained and affected places are stated in Appendix 31.

The writer inspected with the Assistant Electrical Engineer parts of the roof over spinning, "old" worsted spinning and over Saurer looms. Windows in the sides of the building forming part of the roof should be repaired and broken glass panes replaced.

It is recommended that the impregnated black sheets (over twenty rolls) lying in the Store next to Raw Materials Store are examined and, if found to be in good condition, are utilized for roof repairs. When secured to the roof these sheets may have to be covered with tar to make them waterproof.

ii) Roofs over willow opener and dust shaker

Part of the corrugated roof over the willow opener was missing. Corrugated sheets were propped up against the wall of the General Stores and no notice was being taken that the roof could have easily been

Continued...

VI. CONDITION OF MILL BUILDINGS, MILL YARD, HOUSES IN THE MILLS' COLONY, CLUB HOUSE, DISPENSARY, GUEST HOUSES, AND THEIR MAINTENANCE

completed. The available corrugated sheets were placed over the willow opener at the end of March 1986.

There is no roof over the dust shaker. It is recommended that corrugated sheets are bought and roof erected (on the existing pillars) over the dust shaker to prevent further deterioration of machine condition due to exposure to rain and sun.

1.2 Damaged floor throughout the plant

Generally speaking the floor throughout the plant is in a "medium" condition, but there are many places where the surface of the floor is broken, particularly in carding department. A large hole was in greasy burling mending department. Reference: Appendix 32.

It is recommended that every place where there is a hole in the floor is repaired in every department starting in carding department. When an armful of blend is picked from the floor by an operative to be put into the hopper of a carding machine and the floor is broken in the area over which the blend was spread, then sand, stones, etc. are fed with the blend into a hopper and consequently card clothing is damaged. Furthermore, soil clogs up the card clothing resulting in uneven web, irregular slubbing, and uneven yarn as well as necessitating more frequent stopping of the carding machine for fettling and thus lowering the output.

Some repairs to the floor in carding department were done during March 1986. When the writer asked why the repairs stopped, he was told that there was no cement in the Stores. Subsequently, the writer discovered that there were about 269 (two hundred and sixty nine) bags of cement in the General Stores. Only sand and small stones were needed. The writer was told that a tractor load of sand costs about Rs.125.- (one hundred and twenty five rupees), and a tractor of small stones about Rs.90.- (ninety rupees).

Large hole in burling and mending department was repaired after 10 April 1986 and other repairs proceeded at a much quicker pace.

It is recommended that sufficient quantity of sand and small stones should be bought to repair the floor throughout the plant starting in areas around the willow opener and dust shaker located next to the scrap yard behind the General Stores.

The remaining open ducts in the floor housing conduit pipes in the "new" worsted spinning department should be covered with pieces of wood.

Continued...

VI. CONDITION OF MILL BUILDINGS, MILL YARD, HOUSES IN THE MILLS' COLONY, CLUB HOUSE, DISPENSARY, GUEST HOUSES, AND THEIR MAINTENANCE

1.3 Damaged walls and openings for ventilation

All holes in the walls should be repaired to maintain a level of temperature inside the mill. During some mornings in winter it was cold inside the mill - low temperature has an adverse effect on processing particularly in carding and spinning.

Openings in walls made to accommodate ventilation fans should be well covered before winter to prevent cold air coming in.

1.4 Atmospheric conditions inside the mill buildings

During the writer's mission there were no correct and stabilized atmospheric conditions inside the mill buildings.

Correct temperature and relative humidity are necessary in order to obtain optimum working conditions which contribute to the reduction of static electricity, reduction of "fly" and waste in carding, increased output and improved quality because end breakages are reduced in spinning, winding and weaving, and yarns are of constant strength, increased elasticity and more even.

During the winter mornings it was very cold in carding and spinning departments - such conditions cause uneven slubbing and yarns. In addition, good atmospheric conditions reduce absenteeism and provide comfort to the employees.

The writer recommends for woollen mills and worsted mills temperatures and relative humidities quoted in Appendix 33.

2. Mill yard

It is recommended that the cracks and holes in the surface of the yard should be cemented and smoothed. The yard should be hosed with water from time to time, particularly before wool is spread over part of the yard to dry after scouring. The practice of drying wool in the mill yard should not continue and further reference to this matter is made in part VIII. "Production techniques and processing routines (past, newly-implemented, and recommended)". Point 1.

Water drains should be de-clogged and cleaned. Some cleaning was done during March 1986 but more work should be done on a regular basis.

3. Houses in the Mills' Colony

The writer was invited and visited 3 (three) houses - 2 (two) were very well kept and comfortable inside. The writer understood from the Electrical Foreman that the insides and outsides of some of the houses were damaged and doors to latrines were damaged in some instances or missing, but the writer did not

Continued...

VI. CONDITION OF MILL BUILDINGS, MILL YARD, HOUSES IN THE MILLS' COLONY, CLUB HOUSE, DISPENSARY, GUEST HOUSES, AND THEIR MAINTENANCE

visit these houses. A few metal doors that have been bought by the Mills for fixing to latrines or bathrooms were lying for some time near the Power House - it is recommended that these doors are fixed.

4. Club House

It is recommended that the condition of the rooms in the Club House is improved as some operatives and members of the Staff very often spend their evenings in the Club.

5. Dispensary

The writer visited the Dispensary, which is located across the road from the mill buildings, very briefly on one occasion only. It is recommended that the Doctor submits regularly a list of equipment and medicines that may be needed to the Managing Director.

6. Guest Houses

It is recommended that the condition of the Guest Houses should be improved and particularly housekeeping of the rooms and shower rooms should be greatly improved - both improvements can easily be implemented with the man-power and physical resources that are already available at Harnai Mills. Gardens in front of the Guest Houses were very well maintained.

7. General recommendations concerning maintenance

It is recommended that to speed up the execution of repairs and to improve maintenance of the mill buildings, mill yard, houses in the Mills' Colony, Club House, Dispensary and Guest Houses one person should be appointed as the Works Engineer. It would eliminate the situation of shirking or passing on the responsibility as was the case in some instances when the writer tried to have some necessary work done to repair the floor in the mill, to prepare the ground around the willow shaker and dust shaker, and the mill yard.

This matter is further referred to in Part XV. "Personnel", Point 3. "Recommendations concerning transfers, upgrading and/or rewarding," Item (iii).

VII. PRODUCTION FLOW PATTERN, STORAGE AND HANDLING, AND GENERAL HOUSEKEEPING

1. General remarks

Progress of material in a systematic manner with minimum backtracking, lowest and easiest weight handling, shortest distance, ample storage space, orderly storage arrangements and good housekeeping throughout a plant each contribute to achieving a better quality of the semi-finished and the finished product, higher output, longer service life of machinery and equipment and less waste in every department and thus result in a lower unit cost.

2. Prevailing situation and recommendations

All subject matters need improvement and should be investigated further to better utilize human and physical resources available at Harnai Mills with the object of facilitating and speeding up of production.

i) Every store and warehouse should be checked and its contents arranged in an orderly manner.

ii) Scrap yards and stores should be looked at to see if there are any items lying around that can be utilized or put in the relevant stores for future use.

Three examples illustrate the existing resources which should have been utilized in the past to improve premises and help production.

a) Wood was needed to repair lattices on carding machines and to cover open ducts in the floor housing conduit pipes in the "new" worsted spinning department. Pieces of wood were found in various places and used for repairing lattices and for covering some of the ducts housing conduit pipes.

b) A trolley for the transportation of full condenser bobbins from carding to spinning was recommended by the TIRDC's Instructor conducting a training course during March 1986. The writer found such a trolley in the scrap yard behind the General Stores and it was sent to the Mechanical Workshop for repairs.

c) Over 20 (twenty) rolls of impregnated black sheeting were buried under other items in a store next to the Raw Materials Stores. This sheeting would probably require to be covered with tar after being used but it could have been used for the repairs of the mill roof which was leaking badly in many places.

2.1 General Stores

Card index was well kept and information about items and quantities in the Stores was readily available. Some rearrangement of the actual storage places was necessary - rearrangement will result in more storage space becoming available.

Continued...

VII. PRODUCTION FLOW PATTERN, STORAGE AND HANDLING, AND GENERAL HOUSEKEEPING

2.2 Chemical Stores

Cursory inspection had shown that some rearrangement of the actual storage places was necessary. Rearrangement will result in more storage space becoming available.

2.3 Raw Materials Stores

The Store was messy. Keeping together of one type of material and an orderly arrangement of bales and sacks will result in much more empty space becoming available for buffer stocks of raw materials.

The matter of a considerable amount of old stocks of raw materials and yarns is dealt with in Part XXI. "Product mix. Development of new yarns and fabrics. Utilization of the old stocks of raw materials and yarns", Point 1. "General remarks and prevailing situation".

2.4 Stores next to Raw Materials Stores

The Stores were messy. An orderly arrangement of various items will result in much more space becoming available for storage of equipment or spare parts currently kept in various departments.

For example, large boxes with old card clothing which were kept near Laroche Junior Breaker machine in the blending department should be put in this Stores thus giving much more space in blending area to handle raw materials such as hard thread waste awaiting pulling or wool waiting to be blended. Boxes with old card clothing that are put in the Stores should be covered with paper and pieces of any old cloth for protection against dirt and dampness.

N.B. There was sufficient number of persons on the payroll of the Stores to clean up and rearrange the General Stores, Chemical Stores, Raw Material Stores and Stores next to Raw Material Stores.

2.5 Yarn Stores next to Winding

Some rearrangement of the existing storage of yarns was necessary. The Stores are large enough to accommodate the projected increased throughput of yarns and some buffer stocks of yarns used in the on-going production.

2.6 Yarn Stores in the "New" Worsted Spinning

The Store is large enough to accommodate worsted yarns to be made in the future. The Store should be cleaned and items rearranged in preparation for the utilization of the old stocks of yarns and for the eventual re-start of the Worsted Section.

Continued...

VII. PRODUCTION FLOW PATTERN, STORAGE AND HANDLING, AND GENERAL HOUSEKEEPING

2.7 Blending

The matter of handling and storage of bales containing fearnoughted blends is dealt with in Part VIII. "Production techniques and processing routines (past, newly-implemented...", "A. Woollen Section", Point 4. "Blending and oiling".

2.8 Carding

i) Stands (similar to the existing one near Torigoe card) for storing of full condenser bobbins awaiting transportation to spinning should be made and erected by the Mechanical Workshop next to the wall which is opposite to the condenser end of each carding machine. Full condenser bobbins should not be put on the floor in order to prevent damaging the slubbing.

ii) 2 (two) trolleys for transportation of full condenser bobbins from carding to spinning should be made available - one was being repaired by the Mechanical Workshop.

Full condenser bobbins should not be carried by the operatives as the slubbing can easily be damaged during handling resulting in additional thread breakages during spinning and contributing to uneven and/or weak yarns.

2.9 Spinning

Stands (similar to the existing one near Torigoe card) for storing of full condenser bobbins (which await placement on the machine) should be made and erected by the Mechanical Workshop near each working ring spinning frame and working woollen mule to prevent damage to slubbing. Full condenser bobbins should not be kept on the floor.

2.10 Winding (near ring spinning frames)

Neither empty nor full weft pirns and cheeses should be kept on the floor but in boxes in order to prevent damage to yarn packages resulting in unnecessary waste of yarn.

2.11 Warping

In order to avoid damaging of the warp beam flanges and the floor empty warp beams should not be dragged on the floor. Empty warp beams should be wheeled on a small trolley available for the transportation of full warp beams from warping to the looms.

2.12 Reaching-in

Shafts awaiting use should be hung on two metal bars fixed to the wall and not left on the floor in order to prevent damage to the wooden frames and to neald wires.

Continued...

VII. PRODUCTION FLOW PATTERN, STORAGE AND HANDLING, AND GENERAL HOUSEKEEPING

2.13 Weaving

i) Maintenance and storage of ancillary equipment that is not in use e.g. weaving reeds (and warping reeds), shaft frames, heald wires, shafts, drop wires, etc. should be improved further. Various items of expensive ancillary equipment were lying around near reaching-in and in the Saurer loom shed (shafts propped up against wall and getting bent, a pile of drop wires on shelves, etc.). During March/April 1986 metal bars were fixed in the wall in the Saurer loom shed and spare shafts were hung.

ii) Dent wires in all weaving reeds and warping reeds that are not in use should be straightened and cleaned. A ticket should be attached to each reed and reeds laid flat on shelves near reaching-in operation or in the Saurer loom shed, or be sent to the General Stores to maintain good condition of the reeds for future use. Reference: Appendix 34.

iii) All drop wires lying loose on shelves should be cleaned, straightened, made into bundles, tied with a string and put in boxes to maintain good condition of the drop wires for future use. Reference: Appendix 34.

2.14 Material flow and handling

i) One example was when an operative had to walk 9 (nine) times to take 9 (nine) cheeses of yarn from a storage box and put the cheeses on pegs of the winding machine ready for winding. The storage box was between the pirn winder and the Gusken warping machine, some distance from the winder.

The following exercise was carried out and calculations made on 20 March 1986 jointly with the Deputy Weaving Master who timed the operation with the stop watch.

Time taken to bring 9 (nine) cheeses from a box and put on pegs 1.78 minute

Then storage box was placed immediately behind the winder

Time taken to take 9 (nine) cheeses from the box and put on pegs 0.78 minute

saved: 1.00 minute

Suppose any 1 (one) operative performs 10 (ten) tasks per 1 (one) day x 10

saved: 10.00 minutes

Suppose there are 500 (five hundred) employees at Harnai Mills x 500

saved: 5000.00 minutes

83.33 (eighty three point thirty three) man-hours saved per 1 (one) day.

Encouragement was given to the Deputy Weaving Master to think and act along similar lines.

Continued...

VII. PRODUCTION FLOW PATTERN, STORAGE AND HANDLING, AND GENERAL HOUSEKEEPING

ii) Whipping (sewing) of blankets is one amongst many other areas which should be investigated further to improve material flow and handling thus save time, increase output and reduce unit cost.

2.15 General housekeeping throughout the plant

It is recommended that the general housekeeping should be improved throughout the plant. The first step being placement - in every department - of a few old, empty oil drums (lying in the scrap yard next to the General Stores) for throwing in of dirt, pieces of wood and bits of metal. In carding department, for example, if a piece of wood and particularly a bit of metal band which was used for fastening of a wool bale is picked from the floor with a handful of blend and fed into the hopper of a carding machine it will damage the card clothing which is expensive.

VIII. PRODUCTION TECHNIQUES AND PROCESSING ROUTINES (PAST, NEWLY-IMPLEMENTED, AND RECOMMENDED)

WOOLLEN SECTION AND WORSTED SECTION

General remarks

Correct, appropriate and economical production techniques and processing routines - and their sequence - form one part of the whole process design. They are interdependent and constitute one of the very important factors which not only influence but very often determine the amount of waste being made, the quality and the end-use of the final product, its appeal to and acceptance by the customer, and the unit cost of the semi-finished and finished product. This is particularly so in cases of woollen manufacturing and worsted manufacturing where numerous variables influence the finished product and ultimately contribute to the success or failure of any mill.

The Concise Oxford Dictionary, Fifth impression, 1978, defines technique as " ... mechanical skill in art; means of achieving one's purpose, esp. skilfully."
and
routine as "Regular course of procedure, unvarying performance of certain acts; ... sequence of instructions for performing a task."

In this context the writer considers, for example, drying loose wool in a drying chamber or spreading the wool on the ground in the mill yard to dry in the sun to be a technique, and the sequence of finishing operations e.g. cloth inspection, milling, washing, drying, etc. or cloth inspection, washing, milling, raising, etc. to be a routine.

Skilful devising and implementing of the production techniques and processing routines requires technological knowledge, practical experience, organising ability, and expertise in their concurrent application.

The type, the quality and quantity of the raw materials used for specific purposes, the type and number of machines installed, ancillary equipment available, layout of the machines within each department, plant layout, number of employees who can perform specified tasks, and auxiliary agents used e.g. type of blending oil, soap, dyestuffs, etc. must be taken into account when devising and implementing any production technique or processing routine.

For example, appropriate production techniques in preparatory to weaving and in weaving departments will reduce the amount of waste being made, improve the overall weaving efficiency and the quantity of output; appropriate dyeing

Continued ...

VIII. PRODUCTION TECHNIQUES AND PROCESSING ROUTINES (PAST, NEWLY-IMPLEMENTED, AND RECOMMENDED)

WOOLLEN SECTION AND WORSTED SECTION

and finishing routines will impart the desired characteristics and properties such as colour, handle, appearance, strength, etc. thus "making" the finished product to be in demand.

To facilitate the assessment of the prevailing situations at Harnai Mills, the interpretation and the implementation of - the past, the newly-implemented, and the recommended for the future - production techniques and processing routines are being dealt with simultaneously. For reasons of expediency production techniques and processing routines are henceforth referred to as techniques and routines respectively, and are being dealt with under the headings of individual processes or stages in processing.

A. WOOLLEN SECTION

1. Wool scouring and drying

Wool scouring was done in a scouring set. After squeezing between the last set of rollers the wool was either taken for drying in a drying chamber (heated by steam and located next to the scouring set) or transported on a conveyor belt (passing through a large hole in the outside wall of the building) on to the ground of the mill yard where the wool was manually spread to dry.

The writer realizes that drying of wool by spreading it in the mill yard was done to save steam and thus furnace oil but the drying of wool directly on the ground must be stopped. The wool was getting dirty again picking up soil and dirt from the ground, and what was most detrimental, small stones were picked up with the wool when it was, after drying, put in bales ready for blending. Soiled wool contributed to difficulties during carding and uneven slubbing and yarns - emulsion spread during blending mixed with dirt clogged up the card clothing necessitating more frequent than otherwise stoppages of the carding machines for fettling resulting in low production. Stones are always damaging fearnought machines and when passed in a blend into a hopper of a carding machine they cause damage to the expensive card clothing which was already in poor condition.

In the event of the second mission

a) scouring liquid (strength and temperature) should be investigated and - if found necessary - amended to obtain optimum scouring action,
b) the writer will discuss with the Mechanical Workshop In-charge and the

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VIII. PRODUCTION TECHNIQUES AND PROCESSING ROUTINES (PAST, NEWLY-IMPLEMENTED, AND RECOMMENDED)

A. WOOLLEN SECTION

Managing Director a possibility of making and erecting a large rack or a platform for the wool to be dried without coming into contact with the surface of the mill yard.

N.B. If, in order to reduce consumption of furnace oil to generate steam to heat the drying chamber, the Mills are compelled to continue dry wool in the mill yard then a very large tarpaulin sheet should be purchased and spread on to cover a part of the mill yard for the wool to be dried on it. After drying the wool the tarpaulin sheet should be cleaned when it is being rolled up and then stored away until its next use. The practicality and the costs of a rack or a platform vis-à-vis a tarpaulin sheet should be considered before a decision is taken.

2. Rag pulling

There was no rag pulling operation at Harnai Mills during January, March and April 1986. This operation should be established at the Mills - the reasons and specific recommendations are given in Part XXI. "Product mix. Development of new yarns ...", Point 1. "General remarks and prevailing situation", (4th, 5th and 6th paragraphs) and Point 2. "Recommendations", Item (ii).

3. Waste pulling

It is stated in Part XII. "Quality of semi-finished and finished products. Quality ...", Point 2.1 "Quality of the semi-finished ...", Item (i), Entry (c) that:

"Some of the own (made at Harnai Mills) hard, thread waste pulled at the Mills was too "short" and there was an excessive amount of clusters of unpulled threads and knots; both factors contributing to difficulties during carding of blends and resulting in uneven yarns".

In view of the above situation the waste pulling machine (Laroche Junior Breaker) should be checked and re-set to produce longer-fibred and knot-free pulled waste. Some small amount of individual, short, unpulled pieces of threads is unavoidable but a small amount of these pieces can be "opened out" during subsequent fearnoughting and carding. "Longer" waste without clusters of hard threads and without hard knots will - when mixed with other ingredients of a blend - give a more uniform mixture of fibres throughout the blend that

Continued ...

VIII. PRODUCTION TECHNIQUES AND PROCESSING ROUTINES (PAST, NEWLY-IMPLEMENTED, AND RECOMMENDED)

A. WOOLLEN SECTION

has been fearnoughted resulting in better carding and spinning also more uniform and stronger yarn. This is particularly so when pulled waste consisting of hard, thread waste is mixed with a comparatively long-fibred Gija wool to make blends for G.S. blanket yarns.

4. Blending and oiling

Woollen yarns are usually composed of a variety of raw materials. Suitable raw materials, good mixing i.e. blending of the ingredients for a blend, good oiling, and a suitable blending routine which must include "mellowing" involve many factors which are indispensable in order

- to obtain good carding and spinning performance and high output,
- to make minimum amount of waste during fearnoughting, carding and spinning,
- to obtain good quality, uniform and sufficiently strong yarn at minimum unit cost.

The raw materials which are going to be used to make a blend should always be similar in length and fineness. Otherwise whether it is a mixture of long-fibred and short-fibred materials or a mixture of coarse and fine materials the resultant blend will cause

- difficulties in carding and spinning,
- an excessive amount of "fly" and droppings" during carding,
- an excessive number of breakages of individual slubbings during carding and an excessive number of breakages of yarn during spinning,
- "twitty" (uneven) yarns

because a carding machine and a spinning frame can be set properly to process effectively only fibres similar in length and fineness.

The quality, method and uniformity of oiling i.e. application of blending oil or emulsion by spraying it are very important. The object of oiling is

- to provide a thorough and even coating of lubricant to all the fibres and thus allow an easier movement of fibre against fibre and fibre against the wire of the card clothing and therefore facilitate carding also reduce the amount of "droppings" during carding,
- to reduce fibre breakage during fearnoughting and carding,
- to reduce the "wildness" of the material and thus reduce the amount of "fly" during carding,

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VIII. PRODUCTION TECHNIQUES AND PROCESSING ROUTINES (PAST, NEWLY-IMPLEMENTED, AND RECOMMENDED)

A. WOOLLEN SECTION

- to assist in fibre movement during drafting and during inserting of twist when spinning,
- to produce a better quality, more uniform and stronger yarn.

"Mellowing" denotes penetration of and spreading through - over a period of time - and thus affording a thorough and even coating of all the fibres of the material by the blending oil or by an emulsion which had been sprayed from a watering can (manually) or sprayed by a mechanical sprinkler.

In the case of hand "layering" of the ingredients and passing the material through 2 (two) fearnought machines "mellowing" must be permitted to take place at 3 (three) stages, namely

a) after the bed of layers of all the ingredients had been laid down with individual oilings of layers having been done at optimum stages during the building up of the bed of layers,
b) after a blend had been passed once through a fearnought machine with individual oilings of blend having been done at optimum stages during the building up of the stack of blend,
c) after a blend had been packed in large bales and before the blend is fed into the hopper of a carding machine.

"Mellowing" can only take place in a warm atmosphere which prevents blending oil or emulsion from solidifying. "Mellowing" results in a more thorough than otherwise and uniform spreading of the blending oil or emulsion throughout the material and thus

- allowing an easier and better carding and spinning,
- reducing number of breakages of individual slubbings and yarns,
- reducing the amount of "fly" and "droppings" during carding,
- producing stronger and more uniform yarns.

The essentials to good blending and oiling are

- raw materials that are used as ingredients must be free from dust and dirt and be compatible in respect of their average fibre lengths, their average fibre diameters and the state of their being "opened" i.e. not compressed,
- optimum proportion of each ingredient,

Continued ...

VIII. PRODUCTION TECHNIQUES AND PROCESSING ROUTINES (PAST, NEWLY-IMPLEMENTED, AND RECOMMENDED)

A. WOOLLEN SECTION

- correct preparation of the raw materials,
- optimum mixing or "layering" of the ingredients,
- optimum number of passages of a blend through the fearnought machine(s),
- correct type of blending oil to be applied directly to some layers of the ingredients or to be mixed with water to make an emulsion,
- optimum percentages of blending oil and water to make an emulsion, if emulsion is used, to lubricate the fibres,
- optimum method and frequency of application of blending oil or emulsion,
- correct percentage of blending oil or emulsion on weight of fibre i.e. on the total weight of the ingredients,
- "mellowing" of the bed of layers of ingredients, and "mellowing" of the finished blend.

There are 2 (two) methods of blending and oiling of blends namely

a) mechanical blending and mechanical oiling using a fine spray of oil or emulsion,

b) "layering" of the ingredients by hand and spraying some layers with oil or emulsion from a watering can and then "pulling down" i.e. cutting through vertically (by hand) so that each cut represents a cross section of the ingredients which are then fed by hand into a fearnought machine.

At Harnai Mills method (b) was employed i.e. hand "layering" and hand oiling which is an old-fashioned and very time-consuming method, and results in low throughput.

The material that was "pulled down" i.e. cut through vertically from the bed of layers was passed through 2 (two) fearnought machines. Emulsion was applied at two stages of blending. The first application (half of the total quantity) was during "layering" when the emulsion was sprayed on top of some layers and the second application (half of the total quantity) was, at intervals, after the blend passed through the first fearnought machine.

i) Prior to 1 February 1986 - and presumably at all times in the past - several very important aspects concerning blending and oiling were wrong. For example, blends for G.S. blanket yarns were laid down as shown in Appendix 35.

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VIII. PRODUCTION TECHNIQUES AND PROCESSING ROUTINES (PAST, NEWLY-IMPLEMENTED, AND RECOMMENDED)

A. WOOLLEN SECTION

Furth-more, during January 1986 the blending department and carding department were cold and "mellowing" as such was not practiced. The matter of the atmospheric conditions is dealt with in:

- Part VI. "Condition of mill buildings, mill yard ...", Point 1.4 "Atmospheric conditions inside the mill buildings",
- Appendix 33.

The routine shown in Appendix 35 did not allow for a good mixing of the blend ingredients due to comparatively thick individual layers of the ingredients. Emulsion was spread only over 2 (two) layers of Gija wool. Consequently, there was comparatively little lubrication of the fibres in the bottom section and in the top section of the bed of layers because the distribution of the emulsion was not uniform.

ii) Raw materials and the then employed blending routine for G.S. blanket yarns was discussed with the Assistant Spinning Master and the Foreman (General Maintenance) in carding. An improved routine was introduced as from 1 February 1986. Reference: Appendix 36.

The new arrangement permits better mixing of all the ingredients because both the individual layers and the individual sections are thinner. Emulsion is applied more frequently i.e. 4 (four) times in half the quantities instead of 2 (two) times in original quantities. More frequent oiling gives a better and more even penetration of the material by the lubricant. Smaller individual sections and a more even distribution of the lubricant facilitate carding and produce more uniform web, slubbing and yarn. Furthermore, emulsion is not in an immediate contact with the Acrylic soft waste as was previously the case. Emulsion is spread over the Gija wool and hard (thread) pulled waste is spread on top of the Gija wool.

iii) The next necessary improvements in the preparation of the raw materials and in the blending routine itself are stated under the following Entries (a), (b) and (c) namely

a) Resting the laid-down bed of layers to permit "mellowing" for a minimum of 24 (twenty-four) hours in a warm atmosphere resulting in a more thorough and uniform spreading of the emulsion to lubricate the material

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VIII. PRODUCTION TECHNIQUES AND PROCESSING ROUTINES (PAST, NEWLY-IMPLEMENTED, AND RECOMMENDED)

A. WOOLLEN SECTION

throughout before "pulling down" i.e. cutting through vertically the material and feeding it into the first fearnought machine. The material which - having passed through the first fearnought machine - is now in the form of a blend should be oiled a second time as has been the practice but should be allowed to "mellow" for a few hours before it is passed through the second fearnought machine. The blend having passed through the second fearnought machine should be packed into large bales which should be allowed to rest in a warm atmosphere for a minimum of 24 (twenty-four) hours to permit further "mellowing" before the blend is fed into the hopper of a carding machine.

Such a routine will allow the blend to "settle" and will result in less "fly" during carding, less "droppings" under the carding machine, better carding, and more uniform web, slubbing and yarn. The routine including "mellowing" could not have been implemented during February, March and April 1986 due to lack of an adequate number of large bales to pack the blends. The matter of having the necessary bales was discussed at the end of the last mission with the newly-arrived Managing Director. The writer understood that the Managing Director could obtain a quantity of hessian cloth from other mills within PIDC. Hessian cloth could be sewn up to make large bales by employees in whipping (sewing) of blankets at Harnai Mills.

Note. On one occasion, only part of a blend for G.S. blanket yarn was processed in a normal way i.e. was put through the 2 (two) fearnought machines and the respective applications of emulsion were made. The remaining part of that blend after passing through the first fearnought was put in a corner of the blending room, and next to a carding machine in the carding room, where second applications of emulsion were made immediately before the blend was fed into the carding machine. The ingredients were not mixed properly; the writer felt the blend - it was wet.

It is a very bad practice and must never be allowed to happen. Both the concurrent and the separate feeding of quantities of blends (which were fearnoughted once and twice) into a hopper, and spraying emulsion on a blend which had been fearnoughted only once immediately before carding is asking for trouble (difficulties in carding and spinning;

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VIII. PRODUCTION TECHNIQUES AND PROCESSING ROUTINES (PAST, NEWLY-IMPLEMENTED, AND RECOMMENDED)

A. WOOLLEN SECTION

clogging up of the card clothing; unnecessarily frequent fettling and stoppages of a carding machine; uneven web, slubbing and yarn; weak and uneven yarn; excessive breakages of individual slubbings during carding and excessive breakages of yarn during spinning) resulting in poor quality of fabric and low output of the semi-finished and finished product.

The whole blend for G.S. blanket yarn was not processed in the usual way because the blend was a usual, large one which required some time for the completion of the processing. Blending room was needed for the processing of a blend for Khaki overcoating yarn which was urgently required - looms needed yarn to weave an order the status of which was already late to meet the delivery date. Reference: Appendix 37.

The matter was discussed with the Assistant Spinning Master who knew and agreed that such a procedure is wrong for any blend. But nothing could have been done to avoid the situation. There were no buffer stocks of raw materials, no buffer stocks of yarns, no bales to pack the semi-finished blend, and all carding machines needed to be supplied with a blend.

b) Purchasing and using of a different type of blending oil to make an emulsion, and applying the optimum quantity of emulsion (containing a higher percentage of oil) on weight of fibre i.e. total weight of all ingredients of a blend. This matter is dealt with in:

- Part XII. "Quality of semi-finished and finished products. Quality ...", Point 2.1 "Quality of the semi-finished and finished products...", Remark (A),
- Part XIII. "Waste control", Point 2. "Prevailing situation", Item (i), Entries (a) and (b),
- this Part, Point 13. "Finishing (wet and dry) including whipping (sewing) of blankets.

Details of a different type of blending oil, recipes for making an emulsion, details of a milling aid, milling recipes, and other relevant information are given in Appendices 38A to 38E.

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VIII. PRODUCTION TECHNIQUES AND PROCESSING ROUTINES (PAST, NEWLY-IMPLEMENTED, AND RECOMMENDED)

A. WOOLLEN SECTION

c) Better-prepared raw materials. This matter is dealt with in this Part under:

- Point 1. "Wool scouring and drying".
- Point 3. "Waste pulling".

iv) Some of the bales containing comparatively coarse and long-fibred Gija wool were highly compressed. The acrylic soft waste, the hard (thread) waste that was pulled and the condenser (slubbing) i.e. soft waste, were comparatively fine, short-fibred and lofty.

Consequently, when the Gija wool was spread in layers during the building up of the bed of layers (consisting of different ingredients) the Gija wool was in large and comparatively hard lumps which fact was not conducive to a thorough and even mixing of all the fibres of all ingredients during the subsequent fearnoughting and carding operations.

The difference in the average length of fibre, in fineness of the material, and in loftiness, between the Gija wool and the 3 (three) wastes - i.e. the condenser soft waste, the hard (thread) waste that had been pulled and the acrylic soft waste that was usually short-fibred and with an excessive amount of pieces of thread - was one of the main causes of the yarn being "twitty" (uneven).

There was a delay in being able to use the willow opener - in order to "open" the Gija wool (to render the wool in a lofty condition) before "layering" it in the blending department - due to the difficulties in arranging for the cementing of the holes and cracks in the ground and in getting the sweepers to clean thoroughly and prepare the ground around the willow opener during the writer's recent mission.

It is possible that the following advantages

- a higher throughput in blending department,
- the average fibre length, and loftiness, of Gija wool, condenser soft waste, hard (thread) pulled waste, and acrylic soft waste not varying as greatly as in previous blends,
- a more thorough even mixing of all the ingredients of a blend,
- a better carding,
- a stronger and more form ya

Continued ...

VIII. PRODUCTION TECHNIQUES AND PROCESSING ROUTINES (PAST, NEWLY-IMPLEMENTED, AND RECOMMENDED)

A. WOOLLEN SECTION

can be obtained by employing the following routine i.e.

- putting Gija wool through the willow opener once to "open" the wool,
- putting condenser slubbing i.e. soft waste through the willow opener once to "open" the wraps of individual slubbings,
- having a "longer" hard (thread), pulled waste as referred to in this Part under Point 3. "Waste pulling",
- having a better quality i.e. "longer" and thread-free acrylic soft waste,
- making thinner layers and thinner sections when building a bed of layers than those shown in Appendix 36,
- using a different type of blending oil to make an emulsion which should contain optimum percentages of oil and water, and spraying uniformly the material with emulsion, (Reference: Appendices 38A to 38E).
- spraying the layers of materials with emulsion (the whole amount) during "layering" only but more frequently i.e. over 7 (seven) sections or over 10 (ten) sections instead of over 5 (five) sections shown in Appendix 36,
- "mellowing" the bed of layers for a minimum of 24 (twenty-four) hours,
- cutting through (by hand) vertically a well-prepared bed of layers of the ingredients and putting the material through 1 (one) fearnought machine only instead of 2 (two) fearnought machines,
- no oiling after passing the blend through 1 (one) fearnought machine only,
- packing the blend into large bales and resting the bales to "mellow" for a minimum of 24 (twenty-four) hours before feeding the blend into a hopper.

But the definite and detailed recommendations regarding a routine stated in the above mentioned Item (iv) can be given only after an [illegible]ite assessment of the actual quality and the state of each of the raw mate[illegible]s and including acrylic soft waste that will be used to make a particular blend.

v) It was not possible to investigate the other 2 (two) blends and the respective blending routines which were employed during the writer's recent mission because

a) blending for weft yarn for "Rainbow" blanket cloth was not carried out during the mission,

b) time factor did not allow to investigate blending routine for yarn for m[illegible]ng Khaki overcoating cloth.

Continu[illegible] ...

VIII. PRODUCTION TECHNIQUES AND PROCESSING ROUTINES (PAST, NEWLY-IMPLEMENTED, AND RECOMMENDED)

A. WOOLLEN SECTION

N.B. Some remarks concerning wool for yarn for making Khaki overcoating cloth are submitted in Part XII. "Quality of semi-finished and finished products. Quality ...", Point 2.1 "Quality of the semi-finished and finished products ...", Item (i) "Some of the raw materials ...", Entry (d) and in the "Recommendations concerning raw materials - Entries (a), (b) and (d)" that followed.

vi) It is recommended that consideration is given to purchasing and installing - in the near future - of an installation combining mechanical blending and mechanical oiling (using a fine spray of [illegible] emulsion).

A combined mechanical blending and oiling system will permit

a) uninterrupted processing of blends and thus higher throughput in blending department and consequently higher output in terms of the finished fabrics,
b) higher productivity,
c) better mixing and oiling of the ingredients of any blend particularly when Harnai Mills start to produce finer yarns for a wider product mix in up-market fabrics,
d) better quality of yarns and finished fabrics.

The matter of the mechanical blending and oiling system is further dealt with in this Part under Point 14.1 "Short-term recommendations", (last paragraph).

5. Carding

Because of the lack of buffer stocks of raw materials and yarns during the writer's recent mission (and presumably at all times in the past) and the lack of an appropriate production planning and control system, the routine was that any one blend was processed on any one carding machine, on a number of carding machines, or on all the carding machines simultaneously. Presumably, the same routine was employed in the case of ring spinning frames, woollen mules, cheese winders and pirn winders. Such routines result in:

- an excessive downtime of the machines due to the necessity of frequently changing of machine settings to process a specific blend or yarn,
- some variation in the general quality, in the evenness, in the strength and in the number of turns per inch (tpi) of slubbings and yarns because there is always a possibility that one particular blend processed on 2 (two) carding machines and/or yarn spun on 2 (two) spinning frames will vary in

Continued ...

VIII. PRODUCTION TECHNIQUES AND PROCESSING ROUTINES (PAST, NEWLY-IMPLEMENTED, AND RECOMMENDED)

A. WOOLLEN SECTION

terms of yarn parameters however small these variations may be. This is particularly the case when machines are old and need improved maintenance as well as spare parts as was the case with Harnai Mills. Therefore it is necessary that

a) each blend - for whatever type of cloth - should continue to be given a consecutive number. The matter is dealt with in Part X. "Data recording ...", Point 3. "Recommendations", Item (iv),

b) any one blend should be processed on 1 (one) or maximum 2 (two) carding machines, ring spinning frames, woollen mules, cheese winders and/or pirn winders. In any eventuality slubbings and yarns that are produced on any one machine should be ticketed, kept and used separately for specific looms. This matter ties up with the devising and implementing of an appropriate and strict production planning and control system.

6. Spinning

The necessary basic routines and reasons for their employment are stated in the preceding Point 5. "Carding". It is also recommended that the production techniques and processing routines should be investigated further during the writer's possible second mission.

7. Winding

Knots that were tied by the operatives when a thread broke were, on many occasions, incorrectly tied and had long tails. It is very important that whenever a thread breaks the operative is piecing the two ends of a thread employing a "weaver's" knot and leaving short tails only. Bulky knots with long tails obstruct the passage of the knot through the eye of the heald mail and through the dent space in the reed, and often cause a breakage of the thread during weaving resulting in a stoppage of the loom or a missing warp end or a missing pick if the loom is not stopped in time to correct the fault.

Furthermore, if bulky knots with long tails are not opened out (which is a time consuming job) during burling and mending of greasy pieces, the knots are cut off by the shearing machine when the cloth is cropped during finishing, and this results in the finished fabric having small holes all over.

Continued ...

VIII. PRODUCTION TECHNIQUES AND PROCESSING ROUTINES (PAST, NEWLY-IMPLEMENTED, AND RECOMMENDED)

A. WOOLLEN SECTION

7.1 Cheese winding

i) Some of the cheeses were incorrectly wound i.e. the yarn on both sides of the full cones was slack or crossed or both which defect is called "cobwebbing". "Cobwebbing" should be eliminated because it causes problems such as

- slack ends on the warp beams particularly if there are no yarn tensioners on the warping creels as was the case at Harnai Mills,
- unnecessary breakages of yarn resulting in stoppages of the warping machine or in missing warp threads on the warp beam,
- unnecessary waste of yarn if the threads get entangled.

Remedies: better maintenance of the cone winding machines, stricter on-the-floor supervision of the operatives, and in-plant training of the operatives in winding by the TIRDC's instructors.

ii) Full cheeses were kept on the floor near the warping creel where the yarn was liable to be damaged causing unnecessary waste of yarn. Large wooden storage boxes should be made by the Joinery Workshop and any full cones awaiting use should be kept in these boxes.

7.2 Pirn winding

i) Some weft pirns had incorrectly formed bunches at the bases of the pirns and/or some weft pirns were wound too softly resulting in uneven tensioning of individual picks during their insertion when weaving and possible "sloughing off" of the weft yarn during weaving. "Sloughing off" causes unnecessary stoppages of the looms to replace badly wound pirns as well as unnecessary waste of yarn in the weaving department.

Remedies: better maintenance of the pirn winding machines, stricter on-the-floor supervision of the operatives, and in-plant training of the operatives in winding by the TIRDC's instructors.

ii) Full weft pirns were kept on the floor near or under pirn winders where they were kicked about and the loose ends of yarn were getting entangled resulting in unnecessary waste of yarn. Wooden storage boxes should be made by the Joinery Workshop and any full weft pirns awaiting collection should be kept in these boxes.

After some buffer stocks of yarns had been built the full weft pirns should be kept in large boxes in the yarn store.

Continued ...

VIII. PRODUCTION TECHNIQUES AND PROCESSING ROUTINES (PAST, NEWLY-IMPLEMENTED, AND RECOMMENDED)

A. WOOLLEN SECTION

8. Creeling, warping and beaming-off

In comparison with other woollen mills using similar - often lower - qualities of the raw materials producing similar counts of yarns and types of fabrics (in industrialised and developing countries) also basing the opinion on many observations in the weaving shed at Harnai Mills

- the number of missing warp threads and "crossed" warp threads on any warp beam was excessive,
- the warp yarn on the warp beams was too softly wound in some cases,
- the widths of warps between the flanges on the warp beams varied greatly and were often incorrect e.g. widths of warps for G.S. blanket cloth varied between 67 (sixty-seven) inches and 80 (eighty) inches,
- the total length of warp wound on 1 (one) warp beam was too short.

i) In the case of warps for G.S. blanket cloth to be woven on Okuma looms 4 (four) cuts - each 45 yds long, a total of 180 yds - of Nm 2.5 yarn should be wound on 1 (one) beam instead of 3 (three) cuts - each 45 yds long, a total of 135 yds - per 1 (one) beam as was the practice during January, March and April 1986.

ii) In the case of warps for Khaki overcoating cloth to be woven on Hattersley looms 4 (four) cuts - each 50 yds long, a total of 200 yds - of Nm 4 yarn should be wound on 1 (one) beam instead of 3 (three) cuts - each 50 yds long, a total of 150 yds - per 1 (one) beam as was the practice during January, March and April 1986.

iii) In the case of warps for "Rainbow" blanket cloth to be woven on Saurer looms the writer anticipates that the diameter of the warp beam flanges will permit 7 (seven) or 8 (eight), possibly more cuts - each 50 yds long, a total of 350 yds or 400 yds, possibly more - of 2/20 Ne_C cotton yarn to be wound (and should be wound) on 1 (one) beam instead of 6 (six) cuts - each 50 yds long, a total of 300 yds - per 1 (one) beam as was the practice during January, March and April 1986.

iv) The matters concerning

a) slack and/or "crossed" warp threads on warp beams,

b) too softly wound warp beams,

c) the necessity to wind more cuts of warp on 1 (one) warp beam,

Continued ...

VIII. PRODUCTION TECHNIQUES AND PROCESSING ROUTINES (PAST, NEWLY-IMPLEMENTED, AND RECOMMENDED)

A. WOOLLEN SECTION

d) adapting 2 (two) old warping machines located near the woollen ring spinning frames to permit longer warps to be wound on 1 (one) warp beam,

are further dealt with in Part IV. "Condition of machines, ancillary equipment ...", "A. Woollen Section", Point 7.3 "Recommendations concerning creels and warping machines ...", Item (i) "For immediate implementation", Entries (a) "Creels" and (b) "Warping machines".

v) In order to obtain

- good weaving conditions one of which is a good weavability of every warp,
- uniform and equal parameters of all greasy pieces within each type of cloth

it is necessary that the width of warp between the flanges on the warp beam must be at least equal to or preferably wider by 1 (one) to 3 (three) inches than the width of warp in reed for each of the 3 (three) specific types of cloth made during January, March and April 1986.
Standard widths must be established and adhered to in cases of all warps and all looms e.g.

G.S. blanket cloth
Width of warp between the flanges on the warp beam: 75", preferably 76",
Width of warp in reed : 75".*

"Rainbow" blanket cloth
Width of warp between the flanges on the warp beam: 81"
Width of warp in reed : 79".*

Khaki overcoating cloth
Width of warp between the flanges on the warp beam: 75",
Width of warp in reed : 73".*

* Reference: Appendix 39.

N.B. Widths are quoted in inches and not in centimetres because reeds that were used on the old looms (Hattersley and Okuma) and on Saurer looms had been made according to the imperial system i.e. so many dents per 1 (one) inch. In future, if and when more modern, second-hand, reconditioned looms are installed all widths used and quoted should be in the equivalent number of centimetres.

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VIII. PRODUCTION TECHNIQUES AND PROCESSING ROUTINES (PAST, NEWLY-IMPLEMENTED, AND RECOMMENDED)

A. WOOLLEN SECTION

The prevailing situations concerning widths of warps between the flanges on the warp beams, the recommendations already given during the recent mission, the future necessary changes, and the reasons, are stated in Appendices 40, 41.

vi) It should be borne in mind, at all times, that

a) the longer is the total length of a warp per 1 (one) beam the smaller is the amount of wasted yarn and the higher is the output per 1 (one) shift from weaving, particularly in cases such as Harnai Mills where there is no warp tying machine and no dropper pinning machine,

b) any knots that are tied during creeling and warping must be "weaver's" knots with short tails. Slubs and snarls in yarns must not be allowed to pass on to the warping reel,

c) firmly and correctly wound warp beams and without any slack and/or "crossed" warp threads, as well as the correct widths of warps between the flanges on the warp beams, contribute very significantly to good weavability of warps, to higher than otherwise output per 1 (one) shift from weaving with the resources that are readily available, and to the uniform texture of both the greasy and the finished cloth.

9. Weaving

i) Gaiting of warps i.e. positioning of the warp, shafts and the reed in the loom in readiness for weaving, and dropper pinning i.e. insertion of drop wires on the warp threads.

Warp ends from each new warp beam were drawn in through the heald wires of a set of shafts, then drawn through a reed. Full warp beam was then taken to and positioned in a loom which required a new warp. Such a technique results in excessive waste of yarn and unnecessary downtime of the looms when the new warps are being gaited.

Any required number of looms should be allocated to weave each type of cloth and the new warps should be put into the looms which had been weaving the same type of cloth. The new warps should be knotted or twisted to the old warps. The writer does not know whether or not any

Continued ...

VIII. PRODUCTION TECHNIQUES AND PROCESSING ROUTINES (PAST, NEWLY-IMPLEMENTED, AND RECOMMENDED)

A. WOOLLEN SECTION

person at Harnai Mills can knot or twist. In any eventuality a good, second-hand, reconditioned warp tying machine (which can handle both the currently produced counts of warp yarns and the counts of yarns that will be made in future for the envisaged new fabrics) should be purchased as soon as possible.

Good, second-hand, reconditioned and suitable dropper pinning machine should also be purchased to eliminate manual insertion of drop wires on warps in Saurer looms - and eventually on Picanol looms - to reduce greatly the downtime of the looms, to increase the overall weaving efficiency and to reduce the unit cost.

The writer estimates that the joint payback period for both i.e. the warp tying machine and the dropper pinning machine will be 2 (two) to 3 (three) years, possibly less, with 10 (ten) Hattersley looms, 25 (twenty-five) Okuma looms and 10 (ten) Saurer looms in operation.

Hattersley looms and Okuma looms will benefit immediately from the use of the warp tying machine, and Saurer looms will benefit immediately from the use of both i.e. warp tying machine and dropper pinning machine.

The payback will be in the form of
- greatly reduced amount of wasted yarns,
- reduced labour costs for reaching-in and dropper pinning by hand,
- increased output per shift from weaving.

Further reference to reaching-in and dropper pinning is made in this Part under Point 10. "Preparatory to weaving".

ii) Sequence of individual pick insertion during weaving of G.S. blanket cloth and Khaki overcoating cloth on Okuma looms and on Hattersley looms respectively, which have 4 (four) boxes at each side i.e. 4 x 4 box. These cloths should be woven employing 3 (three) shuttles and the pick sequence should be 1 x 1 x 1, which is the best reasonable sequence for fabrics with one type of weft yarn - and is universally employed.

In case of any Hattersley or Okuma looms having 2 x 2 box the pick sequence should be 1 x 1. In case of 2 x 1 box the pick sequence should be 2 x 2.

The above recommended sequences of pick insertion will give much better

Continued ...

VIII. PRODUCTION TECHNIQUES AND PROCESSING ROUTINES (PAST, NEWLY-IMPLEMENTED, AND RECOMMENDED)

A. WOOLLEN SECTION

distribution of any irregularities which may occur in the yarn (thick or thin portions of the yarn, uneven twist, etc.) and thus will give a much more uniform texture and a better quality fabric after finishing.

When using only 1 (one) shuttle which may contain a pirn with irregular weft yarn that yarn forms a solid section across the width of the fabric. Subsequently, that section often causes defects i.e. thick or thin places in the finished fabric or uneven finished width or "cockled" pieces.

The writer realises that it is more difficult for a weaver to watch 3 (three) shuttles instead of 1 (one) shuttle, particularly when there are no weft stop motions fitted in on Hattersley and Okuma looms to stop the loom when a weft pirn is exhausted. But the whole job will be much easier for the weavers when the illuminance in the weaving shed is improved and when they are in-plant trained (at Harnai Mills) by the Karachi-based TIRDC's instructors.

iii) Tying of knots

Comments and recommendations are given in this Part under Point 7. "Winding".

iv) Missing warp threads on the warp beams

On various occasions the writer observed that on Okuma looms and on Hattersley looms weaving G.S. blanket cloth and Khaki overcoating cloth as many as 6 (six) or 8 (eight) threads were being run-in as "spare" ends from cheeses or from weft pirns or from both hung at the back of the loom above the warp sheet. This meant that as many warp threads were missing from 1 (one) warp beam.

Tying-in and/or in drawing-in of "spare" ends (in place of missing warp threads) through the mails of the heald wires and through the reed slows up the production in weaving and often causes faults in fabrics if the tension of a "spare" end that is being run-in is not about the same as the tension of all other warp threads.

Yarn from weft pirns was often used as "spare" ends (which fact was wrong) instead of from cheeses. The weavers should be instructed and watched that cheeses and not weft pirns must be used as "spare" ends. It did not matter very much in cases of G.S. blanket cloth as both warp yarn and weft yarn were exactly the same, and in cases of Khaki

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VIII. PRODUCTION TECHNIQUES AND PROCESSING ROUTINES (PAST, NEWLY-IMPLEMENTED, AND RECOMMENDED)

A. WOOLLEN SECTION

overcoating cloth as both warp yarn and weft yarn were exactly the same. But the use of weft pirns as "spare" ends will cause faults in any cloth when at any time in the future warp yarns and weft yarns are different in any type of cloth. All the weavers should be instructed and watched to eliminate now the bad habit of using indiscriminately any yarn for any purpose.

Furthermore, when a "spare" end is being run-in it should be wrapped once around the backrest roller of the loom to provide a tension to a "spare" end that is similar to the tension of other warp threads. Running-in of a "spare" end without wrapping it around the backrest roller results in a "spare" end being slack thus causing a slack warp thread defect which is visible in the greasy cloth and often in the finished cloth.

Remedies: better maintenance of the warping machines, stricter on-the-floor supervision of the operatives in warping and weaving, and in-plant training of the operatives in warping by the TIRDC's instructors.

v) Loom ancillary equipment and accessories necessary for optimum weaving conditions

To obtain optimum weaving conditions as well as high overall weaving efficiency, and to produce good quality fabrics without any defects originating in weaving, particular attention should be given to the type, condition, maintenance, and the employment of equipment and accessories that are suitable for specific yarns and fabrics.

a) Warp stop motions on Saurer looms

Some of the warp stop motions on Saurer looms were not functioning properly. For example, when a pencil was put in a groove of a to-and-fro moving horizontal bar of the warp stop motion the loom did not stop. It meant that if a warp thread broke and the drop wire dropped the loom would not stop as should have been the case.

It is essential that the warp stop motion on every Saurer loom is set correctly and is functioning well to prevent possible defects in the finished fabrics caused by missing warp threads.

b) Warp stop motions, drop wires, weft stop motions, weft forks, shaft frames, heald wires, reeds, etc.

Continued ...

VIII. PRODUCTION TECHNIQUES AND PROCESSING ROUTINES (PAST, NEWLY-IMPLEMENTED, AND RECOMMENDED)

A. WOOLLEN SECTION

The prevailing situation is described and recommendations are submitted in:

- Part IV. "Condition of machines, ancillary equipment ...", "A. Woollen Section", Point 9.1 "Hattersley looms and Okuma looms" and Point 9.2 "Saurer looms",
- Part VII. "Production flow pattern, storage and handling ...", Point 2.13 "Weaving".

vi) Matters dealt with in this Part under previously mentioned Points 7, "Winding", 8. "Creeling, warping and beaming-off" and 9. "Weaving", Items (i) to (v)

These matters are the basic principles of good winding, warping and weaving practices. They must be observed and implemented if any mill wishes to produce defect-free fabrics at minimum unit cost, and achieve highest possible overall weaving efficiency with the resources that are readily available.

vii) Weaver's attendance to a loom

Weavers should stay all the time with their looms and should not stop the looms in order to go to winding to bring the weft yarn or to take their pieces that had been "doffed" to the grey cloth inspection or drag these pieces on the floor to a passage where they were left awaiting to be taken for perching.

There should be 1 (one) or 2 (two) persons in the weaveroom housing Hattersley and Okuma looms

- to bring weft yarn from winding - or from the yarn store when there is some buffer stock of yarns - to each of the 10 (ten) Hattersley looms and 25 (twenty-five) Okuma looms,
- to help the weavers with the doffing of their pieces and then take, on a trolley, the woven pieces away from the looms,
- to help with the gaiting of warps, if not engaged in bringing weft or taking away the pieces.

Similarly, there should be 1 (one) person in the weaveroom housing Saurer looms to perform the same tasks for each of the 10 (ten) Saurer looms.

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VIII. PRODUCTION TECHNIQUES AND PROCESSING ROUTINES (PAST, NEWLY-IMPLEMENTED, AND RECOMMENDED)

A. WOOLLEN SECTION

With the above mentioned procedures - which should be implemented now - the stoppage times of the looms will be reduced and the overall weaving efficiency will be increased.

viii) Loom assignment

Loom assignment for Hattersley, Okuma and Saurer looms was 1 (one) loom per 1 (one) weaver.

As soon as

- there is a person to bring the weft yarns to each loom and take the pieces away,
- the illuminance in the weaving shed is improved,
- the maintenance of the looms is improved,
- the weavers are trained by the TIRDC's instructors,

the loom assignment should be 2 (two) looms per 1 (one) weaver.

Increased loom assignment will necessitate some small increase in the weavers' rate of pay due to more work and more responsibility being involved. Notwithstanding the higher rates of pay to weavers, the labour cost per 1 (one) metre of greasy cloth will be reduced considerably. The average speed of all looms within one type of looms i.e. Okuma, Hattersley and Saurer looms as well as the number of picks inserted per 1 (one) inch of cloth in the loom during weaving will have to be taken into account when calculating the new rates of pay to weavers.

If a decision is taken to replace the existing old Okuma looms and old Hattersley looms with the more modern, second-hand, reconditioned looms - and the correct choice is made regarding the looms to be purchased - then the future loom assignment should be at least 4 (four) looms, possibly more depending on various factors, per 1 (one) weaver, which fact will reduce very considerably the cost of 1 (one) metre of greasy cloth.

ix) Counting of picks inserted per 1 (one) inch in the loom during weaving

The Loom Inspector whose duty was to count picks inserted per 1 (one) inch in the loom during weaving should constantly check the number of picks inserted on each loom (selected at random) in the weaverooms where Hattersley, Okuma and Saurer looms are located.

There was only 1 (one) Loom Inspector presumably working on the general

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VIII. PRODUCTION TECHNIQUES AND PROCESSING ROUTINES (PAST, NEWLY-IMPLEMENTED, AND RECOMMENDED)

A. WOOLLEN SECTION

shift (08.00 hr to 16.00 hr). There should be a second Loom Inspector (a good, reliable weaver could perhaps be promoted to be a Loom Inspector). The 2 (two) Loom Inspectors should work on shifts (one Loom Inspector on each shift) to ensure that the correct and necessary number of picks per 1 (one) inch is inserted, at all times, on every loom. Both Loom Inspectors should be under the jurisdiction of the Quality Control In-charge.

x) In order
- to obtain uniform and equal parameters and textures of all greasy pieces within each type of cloth,
- to facilitate the application of the respective finishing routine to each piece within each type of cloth,
- to obtain uniform and equal parameters and textures of all pieces within each type of cloth after all respective finishing routines are applied,

it is necessary that every effort is made to weave each type of cloth on 1 (one) type of loom only unless dictated to do otherwise in cases of disproportionately large or small orders for any one type of cloth, e.g.
- G.S. blanket cloth should be woven on Okuma looms,
- "Rainbow" blanket cloth should be woven on Saurer looms,
- Khaki overcoating cloth should be woven on Hattersley looms.

The above stated arrangement is closely connected with the necessity of devising and implementing of an appropriate and strict production planning and control system.

10. Preparatory to weaving

The matter of gaiting of warps is dealt with in the preceding Point 9. "Weaving", Item (i) "Gaiting of warps".

Some time in the future consideration should be given to purchasing an automatic drawing-in machine and special warp beam trucks so that whenever necessary all preparatory to weaving processes (i.e. drawing-in to replace manual reaching-in and reed drawing) - in addition to dropper pinning by the dropper pinning machine - can be done mechanically away from the looms and prior to the warps being gaited thus achieving very high productivity.

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VIII. PRODUCTION TECHNIQUES AND PROCESSING ROUTINES (PAST, NEWLY-IMPLEMENTED, AND RECOMMENDED)

A. WOOLLEN SECTION

The special warp beam trucks could also be used for storing of fully prepared warps and transporting them to the looms.

11. Inspection, burling and mending of greasy cloth

In any woollen mill or worsted mill the inspection (i.e. perching, measuring and weighing) of greasy pieces is normally carried out as soon as a piece had been woven and doffed. Such a routine enables any necessary, immediate corrective action to be taken to stop the weaving of any more pieces with the same defects whether the defects originated in weaving or in preceding departments.

Examples of defects being: too light or too heavy piece, too short or too long piece, incorrect width of the piece, missing warp threads or picks, broken picks, uneven selvedges, incorrect reeding, double warp threads or double picks, slack warp threads, thick or thin yarns, large knots or slubs or snarls in yarns, etc.

The writer was told that at Harnai Mills all greasy pieces were inspected once per day only i.e. from 08.00 hr to 10.00 hr or thereabout, which meant that any piece woven and doffed at say 12.00 hr was waiting to be inspected for 3½ (three and a half) working hours during shift "A" and 7½ (seven and a half) working hours during shift "B", a total of 11 (eleven) working hours, and any defects which may have been in a woven piece continued to exist in the following piece that was being woven until the next morning when the previously woven piece was inspected.

The writer discussed during January 1986 the then existing routine with the Quality Control In-charge and the Deputy Weaving Master who wished to speak with and obtain approval from the then Project Manager for a new routine whereby every piece would be inspected as soon as it had been doffed. Approval was given and it was arranged that the new routine would be implemented. After several days the mill slipped back into the old routine - examples being that on 1 February at 19.05 hr there were 7 (seven) pieces and on 27 March 1986 at 21.45 hr there were 10 (ten) pieces doffed from Hattersley looms and Okuma looms laying on the floor waiting to be inspected the next mornings. Reference: Appendix 40 (Part B).

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VIII. PRODUCTION TECHNIQUES AND PROCESSING ROUTINES (PAST, NEWLY-IMPLEMENTED, AND RECOMMENDED)

A. WOOLLEN SECTION

Incidentally, in the future the top man in charge of Harnai Mills should not waste his time and energy on similar matters of inter-departmental liaison not affecting the whole plant i.e. liaison which the departmental In-charges can arrange - and should have the authority to do so - themselves.

It is essential for reasons stated at the beginning of this Point that at Harnai Mills every greasy piece is inspected as soon as practicable. The writer realizes that there may be some difficulties (e.g. availability of qualified personnel, etc.) in arranging the immediate inspection of every greasy piece. It is therefore recommended that the following times are arranged and adhered to regarding inspection of greasy pieces.

08.30 hr to 10.00 hr. 14.00 hr to 15.30 hr.	The Quality Control In-charge and the 1st Loom Inspector should always be present during inspection. The Deputy Weaving Master and the Assistant Spinning Master should be asked to come only in cases where individual pieces have any faults originating in their respective departments.
19.00 hr to 20.30 hr.	The Foreman in weaving who is in charge of shift "B" and the 2nd Loom Inspector should always be present during inspection. The Foreman in weaving should take any corrective action that is necessary to eliminate any faults immediately, if possible. He should also leave a note for the Quality Control In-charge about any faults so that the matter can be investigated further the next morning and further action taken if needed.

The writer estimates that with the projected attainable before 31 October 1986 increase in output from weaving 3 (three) periods each of up to 1½ (one and a half) hour duration, possibly less, would be sufficient to prevent any backlog of greasy pieces waiting to be inspected.

The above stated routine of inspecting pieces 3 (three) times per 2 (two) shifts will go a long way towards complying with the internationally-accepted routine of immediate inspection of greasy pieces.

Inspection, burling and mending of greasy pieces should be under the jurisdiction of the Quality Control In-charge.

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VIII. PRODUCTION TECHNIQUES AND PROCESSING ROUTINES (PAST, NEWLY-IMPLEMENTED, AND RECOMMENDED)

A. WOOLLEN SECTION

12. Dyeing

12.1 Loose stock dyeing*

12.2 Piece dyeing*

* Due to the time factor it was not possible to carry out a thorough investigation of the techniques and routines employed. But a problem of not being able to dye more than about 50 yard lengths of cloth in the existing beam dyeing machine during one dyeing cycle was investigated briefly and the matter is dealt with in Part IV. "Condition of machines, ancillary equipment ...", "B. Worsted Section", Point 5.1 "Beam dyeing machine" and Point 5.2 "Control panel for beam dyeing machine".

The techniques and routines employed, and the dyeing recipes used should be investigated, and if necessary, new ones should be devised and implemented.

13. Finishing (wet and dry) including whipping (sewing) of blankets

The following processing routines employed during January, March and April 1986 for finishing of all 3 (three) types of fabrics that were made were wrong.

- Routine for finishing of G.S. blanket cloth: Appendix 42.
- Routine for finishing of "Rainbow" blanket cloth: Appendix 43.
- Routine for finishing of Khaki overcoating cloth: Appendix 44.

Comments on the prevailing situation, on the quality of finished fabrics and unnecessary waste that was made are given in:

i) Part XII. "Quality of semi-finished and finished products. Quality ...", Point 2.1 "Quality of the semi-finished and finished products ...", Remarks (A), (B), (C), (E) and (F),

ii) Part XIII. "Waste control", Point 2 "Prevailing situation", Item (ii), Entry (e) and Item (iii), Entries (a) and (b),

iii) Part IX. "Buffer stocks of essentials ...", Point 2.1 "Buffer stocks of essentials", Item (ii).

Time taken to mill 1 (one) piece of G.S. blanket cloth was often 4 (four) hours as was the time to mill 1 (one) piece of Khaki overcoating cloth. Reference: Appendices 42 and 44.

In both cases milling time was much too long resulting in low output from milling and excessive "flocking" i.e. excessive loss of fibre which was unnecessary loss of the raw materials used in a blend.

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VIII. PRODUCTION TECHNIQUES AND PROCESSING ROUTINES (PAST, NEWLY-IMPLEMENTED, AND RECOMMENDED)

A. WOOLLEN SECTION

On several occasions the writer examined and felt in milling machines G.S. blanket cloth pieces - they were cold and dry which condition contributed to excessive "flocking", and was contrary to the basic requirements for good milling conditions i.e. some warmth and moisture.

The immediate requirements were:

a) Availability - at all times - of hot and cold water for milling and scouring so that water of any required specific temperature is readily available,

b) Availability of steam to dry pieces in the tentering machine,

c) Improved maintenance of the machines and equipment,

d) A different type of blending oil, and a milling aid.

Reference: Appendices 38A to 38E.

The sequence of operations in the finishing department including whipping (sewing) of blankets should be investigated further.

For example, it is possible that slightly damp instead of dry - but less severe - raising on both sides of the cloth and producing pile and counter-pile or running a piece head-to-tail and then tail-to-head, on both sides, may give a better surface cover pile as well as a better handle. But before submitting any specific recommendations it is necessary to investigate the existing raising machine and the clothing of its rollers to determine the machine's capability to produce the required pile.

In co-operation with the supervisory and technical Staff, new production techniques and processing routines should be devised and implemented - as soon as possible - in the finishing department to improve the quality of the finished fabrics, reduce waste and increase output.

14. General comments and recommendations

14.1 Short-term recommendations

Various production techniques and processing routines were incorrect therefore the whole process design should be improved - the first step being further investigation of the existing techniques and routines throughout the plant. Whenever necessary improved or new techniques and routines should be devised and implemented as soon as possible - in addition to the techniques and routines recommended in various Points of this Part - taking into account an

Continued ...

VIII. PRODUCTION TECHNIQUES AND PROCESSING ROUTINES (PAST, NEWLY-IMPLEMENTED, AND RECOMMENDED)

A. WOOLLEN SECTION

improved maintenance of machinery, and the resources that are readily available at Harnai Mills and can be acquired with some comparatively small amount of cash being spent now for some stock of a different type of blending oil, milling aid, etc.

The exercise of investigating, and then devising and implementing of the most suitable techniques and routines can successfully be carried out only:

- during on-site mission so that it is possible to immediately assess which of the 2 (two) or 3 (three) possible choices would give the best quality of the finished product and the lowest unit cost when using specific types, qualities and quantities of raw materials and auxiliary agents with the existing machinery park,
- in conjunction with further investigation, and if found necessary, adjustment of cloth manufacturing details i.e. the percentages of ingredients in a blend, yarn parameters, and cloth parameters particularly width of warp in reed and consequently greasy width of cloth whilst retaining the required finished width of cloth,
- in co-operation with the supervisory and technical Staff,
- with concurrent devising and implementing of:
  a) an appropriate system of data recording, storage and distribution,
  b) an appropriate system of production planning and control,
  c) an appropriate system of testing and quality control,
  d) an appropriate system of waste control.

In the event of the second mission to Harnai Mills the writer will bring technical literature on, and photographs of, a warp tying machine, a dropper pinning machine (and ancillary equipment for both machines) also full information on a modern, combined mechanical blending and oiling system that utilises mechanical (through atomisation of oil or emulsion) oiling of blends, and will discuss with the Managing Director and PIDC the advisability, indeed the necessity, to purchase now the 2 (two) machines - and at a later date - the mechanical blending and oiling system in order to increase the overall operating efficiency of the whole plant.

14.2 Long-term recommendations

The prerequisites for Harnai Mills' technological progress in woollen manufacturing and worsted manufacturing are:

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VIII. PRODUCTION TECHNIQUES AND PROCESSING ROUTINES (PAST, NEWLY-IMPLEMENTED, AND RECOMMENDED)

A. WOOLLEN SECTION

- continuous improvement in the production techniques and processing routines in accordance with the resources that should be becoming readily available, and in accordance with the machinery being installed,
- continuous improvement in the quality of yarns and fabrics that are being produced,
- re-equipment of the plant,
- major reorganisation of the plant,
- further in-plant training (theoretical and practical) of fitters and operatives,
- further self-education of the supervisory and technical Staff,
- good customer service and marketing,
- good communication with and between employees, and a sense of common purpose,
- continuous, professional and preferably - but not necessarily - qualified in wool textiles top management capable of leading from the front.

B. WORSTED SECTION

1. General comments and recommendations

Production techniques and processing routines in the Worsted Section had not been investigated because this Section was not in operation during the writer's recent mission. But in the light of the general situation which prevailed at Harnai Mills and the quality of worsted yarns and fabrics that were produced in the past the indication was that some techniques and routines were wrong. Reference: Appendices 27A to 27I.

Also basing the opinion on the situations prevailing in the Woollen Section, and on samples of worsted fabrics received from Mr. Z. I. Bokhari, PIDC, during January 1986 it was clearly apparent that some techniques and routines employed prior to production being stopped in 1985 were wrong.

All techniques and routines should be investigated and improved or the new ones should be devised (in co-operation with the supervisory and technical Staff) prior to and during the re-start period of the Worsted Section. In the meantime, all the efforts should be concentrated on the upgrading of the Woollen Section.

IX. BUFFER STOCKS OF ESSENTIALS AND SEMI-FINISHED PRODUCTS

1. General remarks

In any manufacturing organisation requiring a variety of supplies to sustain its production it is necessary to maintain - at all times - a certain amount of buffer stocks of essentials and semi-finished products if an uninterrupted production is to be achieved. This is so unless a very sophisticated system of operating namely "no stock-in-hand" is employed which by its implications cannot be considered for Harnai Mills.

2. Prevailing situation and recommendations

2.1 Buffer stocks of essentials

i) Raw materials

One situation when the lack of stock of raw materials resulted in machinery downtime and the subsequent loss of output is described in Part II. "Products, production, resources (plant, raw materials...", Point 3.1 "Various machines standing idle due to lack of a raw material".

ii) Furnace oil

Due to lack of cash, delays and/or loss of tank-wagons by Pakistan Railways it was not possible, very frequently, to generate steam to dry wool after scouring and/or to run tentering machine during the writer's mission to dry G.S. blanket cloth. Blanket cloth was therefore dried on the roof of the General Stores. Nor was it possible to heat water for cloth milling and scouring. And water for diluting soap for milling had to be heated by a small, self-made heater made from a piece of wood and an electrical element. The situation is illustrated in Appendix 45.

The writer understood that

- The storage capacity for furnace oil at Harnai Mills was 5 (five) tank-wagons,
- 1 (one) tank-wagon contains 21 (twenty one) or 22 (twenty two) metric tonnes i.e. about 20,000(twenty thousand) or 22,000 (twenty two thousand) litres of oil, therefore total storage capacity is about 100,000 (one hundred thousand) litres of furnace oil,
- Price for 1 (one) tank-wagon of 20,000 (twenty thousand) litres was Rs.36,120 (thirty six thousand one hundred and twenty rupees). Reference: Appendix 46.

It is recommended that the buffer stock of furnace oil should not be, at any time, less than 3 (three) tank-wagons i.e. 60,000 (sixty thousand) litres which means an outlay of Rs.108,360 (one hundred and eight thousand three hundred and sixty rupees).

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iii) Diesel oil

A certain amount of buffer stock should be maintained at Harnai Mills.

iv) Petrol

A certain amount of buffer stock should be maintained at Harnai Mills to avoid a situation when petrol is not available in Harnai as was the case when the writer had to travel to Quetta during middle of April 1986 and it was necessary to telephone the next petrol station some miles away to fill the tank of the Wagoneer car on the way to Quetta.

v) Spare parts for machines and replacements for auxiliary installations

A certain amount of buffer stock of most urgently needed and/or frequently used spare parts is necessary. Such as different types of card clothing for various rollers of the carding machines (some card clothing was damaged or had bare patches); there was no spindle band for woollen spinning mule, no fluorescent tubes for replacement throughout the plant, no electric bulbs for milling department on one occasion, etc.

vi) Auxiliary agents and dyestuffs

A certain amount of buffer stock should be maintained at Harnai Mills and particularly a 3 (three) months supply of a different type of blending oil and a milling aid which should be purchased from England via a Pakistan agent before the start of the writer's possible second mission. Reference: Appendix

vii) General recommendation concerning items (i) to (vi) above

In the case of Harnai Mills due to a remote location and the logistic problems it is of paramount importance to maintain - at all times - some stock of essentials as buffer stocks.

A minimum equal to 2 (two) months consumption (unless otherwise recommended) should be kept as buffer stocks of essentials at Harnai Mills. The actual amount of the necessary buffer stocks should be determined by the weekly or monthly consumption rate to be calculated by the respective Departmental In-charges and submitted every month on the same date to the Managing Director, or to the Production Manager/Technical Manager when he is appointed, to enable him to place orders well in advance to maintain certain minimum levels.

2.2 Buffer stocks of semi-finished products

In the context of maintaining the quality and quantity of output it is absolutely necessary - in the case of Harnai Mills - to have some buffer stocks of semi-finished products at each stage of processing in order to

Continued...

IX. BUFFER STOCKS OF ESSENTIALS AND SEMI-FINISHED PRODUCTS

minimise machinery downtime caused by possible long delays in the execution of major repairs which may have to be done in the mill's workshops or by outside companies.

The minimum amount of buffer stocks of semi-finished products at each stage of processing e.g. slubbing, yarn and greasy pieces should be determined by the Production Office and maintained at all times, if the projected attainable production targets are to be met. These buffer stocks of semi-finished products should be used on the basis of "first-made, first to-be-used".

Matters relevant to buffer stocks and concerning Production Office are dealt with in Part XI. "Production planning and control", Point 2. "Prevailing situation" and Point 3. "Recommendations", Items (i) to (v) and (ix).

X. DATA RECORDING, STORAGE AND DISTRIBUTION

1. General remarks

Systematic record-keeping and well organised storage and distribution of information are essential in any manufacturing operation and specifically in woollen manufacturing and worsted manufacturing operations where - in addition to the involvement of human, physical and financial resources, and the time factor - many variables influence the finished product.

The actual exact, correct and up-to-date records permit any future and/or corrective actions to be taken as soon as such actions are needed.

Good records are indispensable for and are part of:

a) effective production planning and control system,
b) effective quality control and quality testing systems,
c) effective waste control system,
d) costings based on the existing facts and figures.

2. Prevailing situation

At Harnai Mills some records were "sketchy" or quoted "off-the-cuff" or difficult to locate or non-existent.

Further reference to records and record-keeping is made in:

i) Part XVI. "Line-and-staff structure. Job descriptions", Point 1. "General remarks and prevailing situation", (3rd paragraph).
ii) Part XX. "Cloth styling and designing function", Point 2. "Prevailing situation and recommendations", (last four paragraphs).
iii) Part XXIII. "Financial situation", Point 2. "Recommendations", (last paragraph).

Some data was recorded according to two systems of weights and measures i.e. Metric (kg, m, etc.) and Imperial (lb, yd, etc.) within one set of records. Such a procedure makes it difficult to control various manufacturing processes and the parameters of semi-finished and finished products. Recording data in two systems increases the danger of mistakes being made during calculations and/or conversions from one system to another.

A few examples of the inconsistency in recording data and storing of information are given below.

a) Count of slubbing and count of yarn were recorded in metric system i.e. Nm count whilst turns per unit length of yarn were recorded in turns per inch i.e. TPI and the direction of twist of yarn i.e. "S" twist or "Z" twist was not recorded until March 1986. Reference: Appendices 47 to 51.

Continued...

X. DATA RECORDING, STORAGE AND DISTRIBUTION

b) Weights and lengths of greasy and finished pieces were recorded in kilograms and metres whilst the weights of fabrics per unit length were recorded in ounces per metre i.e. ozs/m which is the wrong data.
Reference: Appendix 52.

c) Widths of warps in reeds and widths of finished fabrics were quoted in inches,

d) Lengths of warps were quoted in yards. This complicates the calculation of take-up i.e. contraction from warp length to greasy length and shrinkage from greasy length to finished length. Future calculation of the averages for say 30 (thirty) pieces of each type of cloth is essential as a basis for cloth styling/designing, production planning and control, and costing purposes.

e) Spacings of warp threads and picks in looms were quoted in ends per 1 inch and picks per 1 inch i.e. ends/" and picks/". Reed numbers were quoted in number of dents per 1 inch i.e. dents/".

NB: It is difficult to count picks/1cm and inconvenient to count picks/10cm in loom during weaving. Therefore counting of picks in loom should continue on the basis of picks per 1 inch. But for cloth styling/ designing, production planning and control, and costing purposes the calculation should be

$$\frac{\text{Picks/"}}{2.54} \times 10 = \text{picks/10cm}$$

Reeds for old Hattersley looms and Okuma looms (and Saurer looms?) were made according to imperial system i.e. dents/". Therefore as long as Hattersley and Okuma looms are in use spacing of warp threads should continue on the basis of ends per 1 inch. But for cloth styling/designing, production planning and control, and costing purposes the calculation should be

$$\frac{\text{dents/"} \times \text{number of ends/dent}}{2.54} \times 10 = \text{ends/10cm}$$

and

dents/" x number of ends/dent x width of warp in reed (in inches) = total number of ends in a warp

and

width of warp in reed (in inches) x 2.54 = width of warp in reed (in centimetres)

NB: Calculations of averages in contraction (for each type of cloth) from width of warp in reed to width of greasy cloth and in shrinkage from width of greasy cloth to width of finished cloth should be started and be done using centimetres.

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f) Weights of dyestuffs and auxiliary agents used for dyeing of pieces and recorded in dyeing recipes were in pounds, ounces and grammes.
Reference: Appendices 52, 53.

g) Sheets with information on maintenance routines for Picanol looms were among papers concerning various matters in a folder marked "Blend composition and costing data of worsted, woollen fabrics and 'lankets", and the folder was locked in a cabinet in "New" Worsted Weaving Office.

3. Recommendations

It is recommended that

i) All records and storage of information throughout the plant should be investigated and streamlined within the framework of an appropriate, much stricter and "tailor-made" system of data recording and storage. A system based on specific methods of recording and distribution of data to persons concerned should be devised and implemented.

ii) The load of paper work (e.g. the number of carbon copies distributed and the number of signatures on internal data sheets) should be reduced whenever possible. Reference: Appendix 48.

iii) With the exception of unavoidable instances, all data recorded - and perused by the supervisory and technical Staff - should be in one system i.e. metric system.

NB: Nowadays, the metric system of weights and measures is the internationally accepted system and only a small number of textile mills throughout the world use the imperial system. Furthermore, international quotations and specifications as well as technical and commercial literature use metric system.

iv) Each blend, for whatever type of cloth, should continue to be given consecutive reference number as started on 17 March 1986.
Reference: Appendix 47.

v) All records concerning production should be easily accessible and kept in the Production Office. But

a) Records that are needed very frequently by the Departmental In-charges or Foremen should be kept in the departments concerned,

b) Specific records concerning one department or the whole plant e.g.

- Cloth manufacturing details should be kept in Cloth Styling/Designing Office,
- Details of stocks of raw materials, chemicals, spare parts, furnace oil, etc., should be kept in the General or Chemical Stores as relevant,

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- Dyeing recipes should be kept in the dyeing department,
- Results of tests and other quality control data should in kept in Testing and Quality Control Laboratory,
- etc.

vi) The writer envisages that the change-over to metric system will necessitate some tuition, particularly conversion factors and tables, being given to the Staff; and as the work of streamlining and storage of records throughout the plant ties up closely with the introduction of improved or new production techniques and processing routines, therefore in order to achieve the required results the whole exercise of improving information system should be carried out as follows :

- during on-site mission,
- in co-operation with the supervisory and technical Staff, and the Managing Director or the Production Manager/Technical Manager when the middle management level is established at Harnai Mills,
- with concurrent devising and implementing of :
  a) an appropriate production planning and control system,
  b) an appropriate quality control and quality testing system,
  c) an appropriate waste control system.

XI. PRODUCTION PLANNING AND CONTROL

1. General remarks

Production planning and control function as such constitutes usually one part of the duties of the middle management.

Production planning and control is a very important function dealing with many variables in any woollen manufacturing and worsted manufacturing operation. This function influences - in effect it lays the very basis for - machinery general utilization and high output as well as establishing and maintaining customers' goodwill. Effective planning and control of production co-ordinates all the resources that are readily available or can be made available, states precisely what resources are needed in the future and when, in order to deliver - on the specific dates - the finished goods that should have been produced at the minimum unit cost.

The essence of an effective planning and control of production is
- the ability of the person in-charge,
- the inter-departmental liaison,
- "good", readily-available records. The matter of records is dealt with in Part X. "Data recording, storage and distribution".

Nowadays, there are very sophisticated, computerized production planning and control systems installed in various mills throughout the world which provide instant and comprehensive information to facilitate and speed up decision-making. But the consideration of any elaborate system of data processing should be left in abeyance for some considerable time to come. Harnai Mills should, so to speak, "walk steadfastly before they attempt to fly".

2. Prevailing situation

Due to the time factor the writer was not able to check all the records kept by the existing Production Office and investigate thoroughly all its activities.

There was a greasy cloth production register book in which lengths and weights and some other data of pieces were recorded daily by the Production Office. When the writer asked during 19, 20 and 21 April for the monthly greasy cloth production figures these were promptly abstracted and given to the writer.

Details of weights of blen , yarns spun and wound, and the details of aggregate weights of different types of wastes made in carding, spinning, winding, warping, reaching-in and weaving (but not in finishing) were also shown.

The writer understood that the Production Office also maintained some other records. But all the records that were kept were insufficient for an effective planning and control of production.

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XI. PRODUCTION PLANNING AND CONTROL

It appeared that - and it was not the fault of the Production Office - the processing was scheduled to be carried out, and was carried out, rather on the basis of which types and what quantities of raw materials were in the Stores than on the basis of which types and what quantities of the finished products (whether cloths or blankets) were required on a specified and confirmed date of delivery.

Non-availability of raw materials when needed, lack of buffer stocks, and adverse effects on output, are dealt with in:

i) Part II. "Products, production, resources (plant, raw materials...", Point 3.1 "Various machines standing idle due to lack of a raw material",

ii) Part IX. "Buffer stocks of essentials and semi-finished products", Point 2.1 "Buffer stocks of essentials", Item (vii) "General recommendation concerning items (i) to (vi) above".

The following information received from the Sales Office at Harnai Mills on 20 April 1986 illustrates the situation.

Order dated 14 December 1985 from Syed Investment, Lahore, for S.P. Khaki overcoating cloth totalling 17,275 (seventeen thousand two hundred and seventy five) metres @ Rs.93.25 (ninety three rupees twenty five paisas) per metre F.O.R. destination. Finished width of cloth: 53 inches. Cloth to be as per sample. Date of delivery extended to end of April 1986 as per Harnai Mills' letter Nr. BOL/35 dated 7 January 1986.

There was no Khaki overcoating cloth in stock. Therefore, the whole quantity had to be manufactured. The status of that order as of 20 April 1986 was:

600m delivered on 15 and 17 April 1986,

400m was going to be delivered on 20 April 1986,

1,000m delivered which still left 16,275 (sixteen thousand two hundred and seventy five) metres to be delivered between 20 and 30 April 1986.

In the case of Harnai Mills delivery of such a large quantity of cloth within 10 (ten) days was extremely difficult if not impossible. It would be superfluous to quote similar situations concerning delivery dates and quantities outstanding for G.S. blankets and "Rainbow" blankets.

3. Recommendations

In the light of Harnai Mills' needs it is recommended that:

i) An appropriate, much stricter and "tailor-made" production planning and control system should be devised and implemented with particular reference to balancing the maximum attainable outputs with the projected consumption requirements for each department (from wool scouring or

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waste pulling, as the case may be, up to and including finishing) and with the requirements for machines and operatives expressed in terms of working hours (shifts and part shifts) for each department.

ii) Projections of inputs into and the realistically-projected outputs from each department for three-months periods should be prepared, updated and submitted by the Production Office - every month, on the same date - to the Production Manager or Technical Manager, or to the Managing Director until the middle management level is established at the Harnai Mills.

iii) Projections of inputs and outputs should be based on an agreed, attainable overall efficiency of each machine. In this connection Departmental In-charges should check and record the speed of each machine, whenever practicable.

In case of looms input of yarn and output from looms should be calculated in terms of picks inserted per 1 (one) hour. Output in terms of picks inserted per 1 (one) hour should then be converted into metres of any type of cloth that can be woven per 1 (one) working day of 1 (one), 2 (two), or 3 (three) shifts as may be the case; each shift of $7\frac{1}{2}$ (seven and half) working hours.

In cases such as carding machines and milling machines the agreed projected inputs and attainable projected outputs should be based - now and in the near future - on past production records and on practical experience.

iv) Projections of the required inputs and attainable outputs should be made and calculated along the lines of the projections stated in this report in Part III. "Recent and the projected attainable before 31 October 1986 monthly production and the projected monthly raw materials requirements for G.S. blanket cloth, "Rainbow" blanket cloth and Khaki overcoating cloth", and in the attached relevant Appendices.

v) Planning and charting of orders should be such as to enable Production Office to answer - at any time - any questions from the Managing Director, Production Manager/Technical Manager or the envisaged Marketing, Sales and After-sales Function about the status of any individual order; or questions from any Departmental In-charge as to when a specific lot of material will be ready for processing so that scheduled machines can be made ready to start work immediately.

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XI. PRODUCTION PLANNING AND CONTROL

vi) Any excessive variations in the lengths and weights of greasy and finished pieces of the same cloth should be notified immediately to the Quality Control In-charge who should take the necessary action. This matter is further dealt with in Part XII. "Quality of semi-finished and finished products. Quality control...", Point 2.1 "Quality of the semi-finished and finished products of the Woollen Section", Remarks E and F.

vii) Production Office should be under the jurisdiction and reporting to the Production Manager/Technical Manager, or to the Managing Director until the middle management level is established. The Deputy Weaving Master should not be in charge of the Production Office - he should concentrate on all matters concerning winding, warping, preparatory to weaving i.e. reaching-in, etc. and weaving. There should be a very close liaison between Production Office and each Departmental In-charge.

viii) Considering recommended future appointment of the Production Manager or Technical Manager the space occupied by the 2 (two) rooms which constituted Production Office during January, March and April 1986 should be enlarged. Some additional filing cabinets and shelves should be provided.

ix) Because of:

a) the constraints (short-term e.g. lack of spare parts, and long-term e.g. logistic matters, old machines) stated in this report,

b) the most likely necessary short tuition, particularly conversion factors, tables and formulae, being given to the Staff of the Production Office,

c) the recommended implementation of improved or new production techniques and processing routines, in order to achieve the required results the whole exercise of devising and implementing of an appropriate system of production planning and control should be carried out as follows:

- during on-site mission,
- in co-operation with the supervisory and technical Staff, the Managing Director, and the Production Manager/Technical Manager if the middle management level is established,
- with concurrent devising and implementing of:
  a) an appropriate, streamlined record-keeping system,
  b) an appropriate quality control and quality testing system,
  c) an appropriate waste control system.

XII. QUALITY OF SEMI-FINISHED AND FINISHED PRODUCTS. QUALITY CONTROL. QUALITY TESTING. LABORATORY

1. General remarks

"Quality" may be described briefly as all values, characteristics and features of a product or service that jointly influence its capacity to fulfil any specific requirements.

"Quality" is not something that can be "put on" or imparted at any stage of processing or service. It may be said that it is an intrinsic element of every stage of the manufacturing process and service to a customer from the very start i.e. the selection of the right type of raw material, through production to the end i.e. final inspection of the finished product, and further e.g. the service stage of packing and delivering the finished goods.

In view of Harnai Mills' quality of the semi-finished and finished products that were made - and services rendered to customers - during January, March and April 1986 the above mentioned ought to be borne in mind by every employee from a Peon to the Managing Director. Quality-consciousness and quality-mindedness should be developed by every employee of the Mills. "Quality" will help to assure Harnai Mills' competitiveness.

The concept of "Quality Assurance" involves and co-ordinates all the activities and measures within the following areas :

i) Quality Control,
ii) Quality Testing,
iii) Quality Engineering.

If carried out effectively, the above mentioned when considered as one composite is a very useful management tool. The areas of activities of quality control, quality testing and quality engineering in any woollen manufacturing or worsted manufacturing operation are usually as follows :

- preparation of specific documentation relevant to orders received from customers,
- dealing with questions of quality e.g. specifications received from and submitted to customers, reports on defects and sub-standard goods in general, letters with complaints received from customers, etc.,
- preparation and supervision of standards and permissible variations for semi-finished and finished products,
- inspection of incoming raw materials and other supplies (e.g. dyestuffs, oils, etc.), testing and evaluation of samples drawn (at random) from each batch that is delivered, and submission of the reports to the management,
- inter-departmental co-ordination of all matters concerning quality,
- inspection, measuring, weighing, examination and testing at regular intervals, of the samples drawn from - or complete units of - semi-finished and finished

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products e.g. slubbings, tops, rovings, yarns and fabrics, and interpretation of the results of tests during :

a) trial production,

b) bulk production,

- collection (from various sources) of information which is relevant to quality of the semi-finished and finished products made by the company,
- supervision of testing and quality control equipment,
- keeping - and whenever necessary distribution - of data concerning
  a) results of tests that are being carried out,
  b) testing and quality control equipment that is installed in the mill,
- testing of water that is used for processing and testing of effluents,
- co-operation with the personnel function on all matters concerning employees' in-plant training,
- any other activities concerning testing and quality control as required by the management and the supervisory, technical, commercial and clerical Staff.

In the case of Harnai Mills the activities of quality control, quality testing and quality engineering can be incorporated into the remits for Quality Control and Quality Testing. But their smooth functioning as well as good, well-maintained and accurately calibrated equipment are indispensable for an effective operation of the whole system of quality control and quality testing which will help the Mills to rehabilitate their performance and reputation - ultimately Harnai Mills' name should "sell" the cloth.

2. Prevailing situation and recommendations

2.1 Quality of the semi-finished and finished products of the Woollen Section

Prevailing situation

Quality of the semi-finished and finished product was low during January, March and April 1986. This was due to

i) Some of the raw materials being of sub-standard quality e.g.

a) Some acrylic soft waste (bought already pulled) which was a component for blends for G.S. blanket cloth was short i.e. fibres were very short. And there was a great amount of unpulled pieces of threads in the pulled waste. Such acrylic soft waste when blended with comparatively long-fibred Gija wool caused excessive "fly" and "droppings" in carding and together with the unpulled pieces of threads contributed to uneven and poor quality of yarn,

b) Some bales of Gija wool contained "cotty" (matted, entangled or felted) wool,

c) Some of the own (made at Harnai Mills) hard, thread waste pulled at the

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Mills was too "short" and there was an excessive amount of clusters of unpulled threads and knots; both factors contributing to difficulties during carding of blends and resulting in uneven yarns,

d) Some of the Merino II wool was heavily contaminated with vegetable matter (burrs, seeds, etc.). It was not possible to remove all the vegetable matter during fearnoughting and carding with the result that many pieces of finished Khaki overcoating cloth had a very great amount of white specks i.e. vegetable matter that was not possible to be removed during processing.

N.B. Burling of greasy and/or finished pieces would have been prohibitive from the time and cost points of view. Carbonising of loose wool or pieces would have resulted in additional cost and it is doubtful if Harnai Mills could carry out effectively the carbonising process.

Recommendations concerning raw materials - Entries (a), (b) and (d)

Better qualities of raw materials should be purchased. The writer estimates that even if the price per 1kg is higher by say 10% (ten percent) it will - in the final analysis - be advantageous as the amount of waste ("fly" and "droppings") will be much smaller, the quality of cloth will be better, and the processing will be easier.

Recommendations concerning raw materials - Entry (c)

The matter of pulling own hard (thread) waste is dealt with in Part VIII. "Production techniques and processing routines...", Point 3. "Waste pulling".

Recommendations concerning quality of the delivered raw materials

A sample of the raw material submitted with an offer from a supplier and according to which the order for the raw material was placed should be kept in the testing and quality control laboratory as the "original sample" for future reference.

Samples should be drawn (at random) from each bale of every consignment that is delivered and should be compared with the "original sample". If the quality of raw material in any bale that is delivered does not match the "original sample" that bale should not be accepted but sent back at the supplier's expense.

N.B. The writer realizes that in the past such strict procedure was impracticable because on occasions raw materials were needed very urgently due to lack of buffer stocks. Furthermore, payments for previous deliveries might have been overdue possibly compelling Harnai Mills to accept whatever weight and/or quality were delivered. When there are buffer stocks of raw materials at the Mills, at all

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times, and payments are made on due dates, Harnai Mills will be in a strong position to insist on specific quality and, if warranted, reject any sub-standard deliveries.

ii) Poor condition and/or poor maintenance of machinery

The prevailing situation is described and recommendations are submitted in Part IV. "Condition of machines, ancillary equipment...". "A.Woollen Section."

iii) Lack of in-plant training of operatives

The prevailing situation is described and recommendations are submitted in Part XVIII. "Self-education, in-plant training...", Point 4.1 "In-plant training in spinning department" and Point 4.2 "In-plant training in other departments."

iv) Insufficient on-the-floor supervision

The prevailing situation is described and recommendations are submitted in Part XV. "Personnel", Point 2.1 "Supervisory and technical Staff" (4th and 5th paragraphs) and Point 2.2 "Operatives" (1st paragraph).

v) Some of the production techniques and processing routines being incorrect

The prevailing situation is described and recommendations are submitted in Part VIII. "Production techniques and processing routines (past, newly-implemented, and recommended)".

Remarks

A. Large quantities of the G.S. blanket cloth had a bad odour due to incorrect blending oil being used, pieces being washed in washing machines without soap and without hot water, and drying the pieces on top of the roof of the mill buildings,

N.B. The writer had a sample of G.S. blanket cloth analysed (free of charges) in England during February 1986. The analysis had shown the residual soap content in the finished cloth to be 1.38% (one point thirty eight percent) - the acceptaole maximum is about 0.5% (zero point five percent). Reference : Appendix 38 B (page 3).

In the event of the second mission to Harnai Mills similar analyses will be asked to be carried out on samples (taken at random) of "Rainbow" blanket cloth and Khaki overcoating cloth which the writer asked for and was given by the supervisory Staff for reference purposes.

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XII. QUALITY OF SEMI-FINISHED AND FINISHED PRODUCTS. QUALITY CONTROL. QUALITY TESTING. LABORATORY

B. Some of the G.S. blanket cloth, "Rainbow" blanket cloth and Khaki overcoating cloth had a poor handle and very poor surface cover produced during finishing i.e. the cloth was "grinning" (threads were showing through or texture was too open) in some places,

C. Many pieces of G.S. blanket cloth and many pieces of Khaki overcoating cloth had a "boardy" (hard) handle,

D. Some lengths of yarn within one lot were too softly spun or uneven or had slubs. Or there was an easily-noticeable variation in the count of yarn and/or twist i.e. the number of turns per 1 inch of yarn. One example being the results of tests on G.S. blanket yarn carried out in the presence of the Quality Control In-charge and the writer. The required count of yarn was Nm 2.50 and the 6 (six) tests on samples taken at random showed the following counts :

Nm 2.53, Nm 2.38, Nm 2.52, Nm 2.48, Nm 2.58 and Nm. 2.04.

E. There were unacceptably large variations in the weight of 1 (one) linear metre of greasy cloth and finished cloth between pieces of the same type of cloth e.g.

Finished Khaki overcoating cloth (piece Nr.4129) weighed 712g/linear metre,
" " " " (piece Nr.4010) " 918g/linear metre.

Reference : Appendix 57.

N.B. Further unacceptably large variations in the weights of 1 (one) linear metre of greasy and finished G.S. blanket cloth also in percentages of shrinkage and percentages of loss in weight during finishing of G.S. blanket cloth and Khaki overcoating cloth are illustrated in Appendices 8 (page 3) and 57.

F. There were large variations in the widths of the finished pieces of the same type of cloth e.g. 1 (one) piece of Khaki overcoating cloth selected at random was 55 (fifty five) inches whilst the required width was 53 (fifty three) inches. This meant that the cloth was insufficiently milled in width or width was overstretched during tentering or "X" metres of 2 (two) inch strip of cloth was given away without charging.

Recommendations concerning Remark "A"

These are given in Part VIII. "Production techniques and processing routines...", Point "Blending and oiling."

Recommendations concerning Remarks "B", "C", "D", "E", and "F"

In order to achieve good quality of the semi-finished and finished products at minimum unit cost and best performance of the finished products vis-à-vis end-use

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requirements it is recommended that :

i) Yarn and greasy cloth parameters (within the framework of cloth manufacturing details) should be investigated further, evaluated and, if necessary, amended,

ii) Improved or new production techniques and processing routines should be devised and implemented concurrently and in conjunction with the existing or amended cloth manufacturing details.

2.2 Quality of the semi-finished and finished products of the Worsted Section

Past situation and recommendations

Quality of worsted yarns and finished worsted fabrics made prior to production being stopped during July 1985 was also poor in many instances as can be seen from Part IV. "Condition of machines, ancillary equipment...", "B. Worsted Section", Point 7. "Recommendations and comments concerning the re-start of the Worsted Section" and the relevant Appendices 27A to 27I.

It is recommended that before production of worsted yarns and worsted fabrics is re-started consideration should be given to changing slightly the brand names of the previously manufactured products e.g. "Sunlight suiting" instead of "Sunny suiting", "2-and-1 suiting" instead of "2 x 1 suiting", etc.

Such a policy should help to dissociate the fabrics produced in the future from the previously made fabrics thus should help to create a new image for Harnai Mills' fabrics.

In any case it is most likely that the cloth manufacturing details i.e. parameters of yarns and cloths and/or finishing routines would have to be changed to obtain better products so there should be no difficulties in convincing potential customers that they will, in fact, be new products.

2.3 Complaints from customers re : quality

It is recommended that a file marked "Complaints from customers re : quality" should be started and kept in the Testing and Quality Control Laboratory on which all letters received (hopefully none) should be kept as reference. The first item on the file should be Appendices 27A to 27I.

Each letter of complaint when received should be read and signed by every Departmental In-charge so that they are fully aware of the problems which had occurred. And if the corrective action had not previously been taken it should

Continued...

be taken immediately to prevent future problems. The Quality Control In-charge should supervise any actions taken and ensure that all faults had been rectified and all matters satisfactorily resolved.

2.4 Testing and quality control laboratory. Personnel, activities and equipment

Prevailing situation

The space occupied by the laboratory during January, March and April 1986 was barely sufficient to accommodate the then existing equipment. It is not large enough to accommodate the additional, herein-recommended equipment and to enable the Staff to perform their future duties within the framework of a correctly functioning appropriate and much stricter system of quality control and quality testing.

The then existing equipment is listed in Appendix 3.

The condition and maintenance of the room and the existing equipment - with the exception of 3 (three) or 4 (four) pieces of equipment - were poor. Some pieces of equipment needed spare parts and all equipment needs servicing and/or calibrating.

Atmospheric conditions were not controlled to maintain the required standard temperature and humidity.

Personnel listed below was adequate for the testing and quality control activities which were carried out during the writer's recent mission.

1. Quality Control In-charge,
2. Assistant Foreman,
3. Loom Inspector,
4. Upper Division Clerk,
5. Clerk,
6. Helper.

But the number of personnel will not be adequate when the new systems of quality control and quality testing are in operation.

The writer's Terms of Reference includedthe Job Description dated 21 October 1985 (received from UNIDO, Vienna) that listed the following amongst other duties to be carried out :

"- prepare specifications for testing and quality control equipment to be installed during the lifetime of the project;"

Continued...

XII. QUALITY OF SEMI-FINISHED AND FINISHED PRODUCTS. QUALITY CONTROL. QUALITY TESTING. LABORATORY

On 19 April 1986 the writer held a meeting with and proposed - to the Quality Control In-charge, the Deputy Weaving Master, the Assistant Spinning Master, an Assistant in the Laboratory and a Clerk in the Laboratory - some modern, simple-to-operate and reliable equipment that is required for an effective functioning of testing and quality control system. After explanation of the supporting technical literature relevant to the equipment that could be purchased and discussion of Harnai Mills' needs a tentative list of the equipment needed was drawn. Reference : Appendix 54.

That list of the tentatively selected equipment was shown to and discussed with the newly-appointed Managing Director on 20 April, and with the then Project Manager on 21 April 1986.

Prior to leaving Karachi on 28 April 1986 the writer left (for future reference) with Mr. Z.I. Bokhari, PIDC, quotations (dated 11 December 1985 with specifications and brochures) for a range of textile testing and quality control equipment made by James H. Heal & Co. Ltd., Halifax, Great Britain.

Since the end of the recent mission the writer visited James H. Heal & Co. Ltd., and discussed the adaptability and usefulness for various tests of the tentatively-selected equipment. The matter of equipment is dealt with under following "Recommendations", Item (iii).

Recommendations

i) The space occupied by the laboratory during January, March and April 1986 should be enlarged significantly and refurbished. 2 (two) filing cabinets, shelves for storage of samples, counters for placing of equipment, a large table, chairs, stationery, and a book case in connection with the recommended small library should be provided between January and April 1987. Eventually, there should be fully-controlled atmospheric conditions (humidity, temperature, air-conditioning, ventilation) in the laboratory.

ii) The existing equipment should be serviced, calibrated and made fully operational before January 1987 by a firm of specialists in Pakistan.

It is anticipated that spare parts could be obtained in Pakistan or abroad. Some spare parts that were needed are listed in Appendix 55.

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XII. QUALITY OF SEMI-FINISHED AND FINISHED PRODUCTS. QUALITY CONTROL. QUALITY TESTING. LABORATORY

iii) The following additional, modern, comparatively simple-to-operate equipment should be purchased from James H. Heal & Co. Ltd., Halifax, Great Britain, between February and April 1987 and henceforth used regularly :

1.	Betacount model 335 (weight scale)	£1,450.00
2.	Martindale wear & abrasion tester model 103	£3,746.00
3.	ICI pilling tester model 116/2	£1,316.00
4.	IWS viewing cabinet	£510.00
5.	Digital Movistrob model 180/2100W/P and power supply	£792.00
6.	Digital pH meter model 310	£329.00
7.	Gyrowash model 315/4	£2,769.00
8.	Sample cutter model 230/100	£235.00
9.	Deltamoist model 345	£1,125.00
10.	Light fastness tester model 225	£2,446.00
11.	Quadrant twist tester model 73M	£800.00
12.	Single thread strength tester model 78BM	£2,920.00
13.	Hardness testers models HP5 and HP10F £130.00 each	£260.00
14.	Zetascan model 330	£1,002.00
15.	Wrap reel model 55M	£790.00
16.	Yarn tensionmeter model DXX400	£385.00
	Total F.O.B.	£20,875.00
	C.I.F. Costs	£810.00
	Total C.I.F. Karachi by seafreight	£21,685.00

(Twenty one thousand six hundred and eighty five pounds sterling)

Correspondence, updated quotations, specifications and supporting technical information in the form of brochures/leaflets are attached as Appendices 56/1 to 56/20.

iv) Modern, sophisticated testing and quality control equipment such as made by Zellweger Uster Ltd., Switzerland, to test and evaluate worsted yarns should be purchased between May and December 1988.

v) Quality Control In-charge should attend - some time during 1987 - a training (or re-training) course at the Textile Industry Research & Development Centre in Karachi to broaden his theoretical and practical knowledge of testing and quality control mattters, particularly presentation and interpretation of the results of tests.

N.B. The writer understood that TIRDC offer (in addition to other courses) a 12-working-days course for Textile Testing Technicians and a 15-working-days course for Quality Controllers. In the event of the second mission the writer will obtain further information and submit a more detailed recommendation.

Continued...

XII. QUALITY OF SEMI-FINISHED AND FINISHED PRODUCTS. QUALITY CONTROL. QUALITY TESTING. LABORATORY

2.5 Quality control. Quality testing

Prevailing situation

The writer's Terms of Reference included the Job Description dated 21 October 1985 (received from UNIDO, Vienna) that listed amongst other duties to be carried out :

" - establish a testing and quality control system;"

Daily observations of all machines and processing throughout the plant enabled the writer to form a definite judgement that devising and implementing of a modern and more sophisticated than the then employed testing and quality control system during January, March and April 1986 would have been meaningless.

It was both necessary and urgent to remedy, at source - and with the very limited resources that were available - the then existing obvious deficiencies in many areas, or at least, to determine precisely the problems, causes and reasons before attempting to quantify the defects. At that time, pure statistics would have been everybody's waste of time and effort.

The simple tests that were being carried out, the simple calculations that were being made showing great variations occuring from time to time, and all the records kept confirmed the judgement made.

Testing of slubbing and yarn to determine the actual count and the number of turns per unit length of yarn, was being done on a regular but not sufficiently frequent basis by the Staff of the laboratory. Number of picks inserted per 1 inch in the cloth during weaving was checked regularly by the Loom Inspector. Weights and lengths of greasy pieces were checked and recorded during inspection of woven pieces prior to burling/mending, and data kept by the Production Office. Weights and lengths of finished pieces were recorded and kept by the finishing department.

But the results of the laboratory tests were, on some occasions, not acted upon soon enough to enable immediate corrective measures to be taken to prevent off-standards continuing and thus affecting adversely the quality and quantity of output. One example was when the weavers came to the supervision complaining about not being able to maintain the usual production in weaving due to excessive breakages of weak yarn.

Any weak yarn should have been discovered during testing or, at the latest, during winding. And the Assistant Spinning Master should have been informed to take the necessary action before further spinning proceeded - well in advance of the subsequent winding, warping and weaving.

Continued...

XII. QUALITY OF SEMI-FINISHED AND FINISHED PRODUCTS. QUALITY CONTROL. QUALITY TESTING. LABORATORY

Yarn strength testing and cloth strength testing equipment was installed but due to the time factor the writer was not able to investigate the frequency and the results of the tests.

Samples of raw materials had been drawn from the bales at the time of their delivery to Harnai Mills and the general quality assessed e.g. whether acrylic soft waste was "short" or not and whether it contained a great amount of unpulled (hard) pieces of threads.

Quality Control In-charge and other Departmental In-charges had been aware of the sub-standard quality of the raw materials delivered on some occasions and pointed out these matters to the writer confirming writer's previous opinion that sub-standard qualities of raw materials impaired processing and affected adversely the quality and quantity of output of semi-finished and finished products.

Recommendations

In the light of the recent poor quality of the semi-finished and finished products as described in this Part and referred to in other Parts of this report - and observed daily by the writer during in-plant work - also considering Harnai Mills' need to improve and be seen to improve substantially the quality and the trade image of the finished products it is recommended that

an appropriate and much stricter quality control and quality testing system is devised and implemented which should incorporate

- systematic (regular and frequent) testing procedures,
- recording, analysing, interpreting and distributing of the results of tests,
- establishing of realistic standards and permissible limits of variations depending on the raw materials used, the present condition of the existing machinery and on the processing routines employed,
- establishing quick procedures for :
  a) notifying without delay the Quality Control In-charge of any significant deviation from the standard parameters of semi-finished and finished products or any sub-standard qualities of the products already made so that he can take whatever action is necessary,
  b) notifying without delay the Departmental In-charge concerned when the results of the test(s) on samples taken at random from bulk production show that the product is outside the permissible limits of variation.

This exercise can be carried out and the required results achieved only :

- during on-site mission,
- after giving a short tuition in the rudiments of statistical control to

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the laboratory personnel and providing the personnel with a small manual containing important information on testing and quality control matters particularly factors influencing the quality of the semi-finished and finished products stating causes of faults also remedial actions to be taken to correct the existing defects and to prevent future defects,

- in co-operation with the supervisory and technical Staff, and the Production Manager/Technical Manager if the middle management level is established at Harnai Mills,
- with concurrent devising and implementing of :
  a) an appropriate system of data recording, storage and distribution throughout the plant,
  b) an appropriate system of production planning and control,
  c) an appropriate system of waste control.

XIII. WASTE CONTROL

1. General remarks

Some waste is unavoidable in woollen manufacturing and in worsted manufacturing as is also the case in any manufacturing operation. But it is most essential that the amount of waste is as low as possible at every stage of processing. In every instance the amount of waste made in each department has a direct and great influence on the output and the unit cost of semi-finished and finished product. The higher the amount of waste the lower is the output produced from a given quantity of the raw material and the higher is the unit cost of the finished product.

Waste made in a woollen manufacturing operation could be classified into:

a) Waste that can be re-processed - and used again - by the mill,

b) Waste that cannot be re-processed by the mill but can or cannot be sold.

2. Prevailing situation

In the case of a woollen manufacturing operation such as Harnai Mills it is very important to bear in mind that the re-processable waste i.e.

- condenser (slubbing) i.e. soft waste from carding and spinning,
- hard i.e. thread waste from spinning, winding, warping, reaching-in and weaving,
- thrums and small pieces of greasy cloth from weaving,
- small pieces of finished fabrics e.g. G.S. blanket cut pieces,

decreases in its manufacturing value every time the waste is processed as a component of a blend.

For example, when a certain percentage of condenser (slubbing) i.e. soft waste or hard (thread), pulled waste consisting of yarn from say blend "A" is used in blend "B" which is spun into a yarn, the manufacturing value of the condenser, soft waste and the manufacturing value of the hard (thread), pulled waste, consisting of yarn from blend "B" will be lower because it will be "shorter" due to a certain small amount of fibres being broken during fearnoughting (willeying) and carding of any blend. And the problem of the "short" waste compounds progressively with every blend that follows and contains waste as its component(s) resulting in further excessive waste as can be seen from the examples quoted and particularly the details marked ** in Item (i), Entries (a) and (b) in the paragraphs that follow.

At Harnai Mills the amount of waste made in every department - as observed during January, March and April 1986 and/or according to figures supplied to the writer - was much too great and nowhere near to the low amounts of waste made by other mills (in industrialised and developing countries) that are equipped with similar machinery and producing similar types of cloth. Excessive waste contributed significantly to the high unit cost at Harnai Mills.

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A few examples quoted below illustrate the situation that prevailed.

i) The writer was told by the Deputy Weaving Master on 21 April 1986 which information was based on Harnai Mills' records that -
Reference Appendix 10.

a) Weight of a blend for G.S. blanket cloth	* 26,100 Kg	Yield		Yield
Weight of yarn after spinning	19,481 Kg	74.64%	Yield	68.67%
Weight of yarn after winding	17,923 Kg		92.00%	
From that blend				
Condenser (slubbing) waste		1,500 Kg	=	5.75%
Hard (thread) waste		1,558 Kg	=	5.97%
**Visible waste (sweepings)		2,000 Kg	=	7.66%
**Invisible waste ("fly", throw-away)		3,119 Kg	=	11.95%
		8,177 Kg	=	31.33%

Estimated, quoted by the Deputy Weaving Master, waste from weight of yarn wound to weight of greasy pieces = 8%. Reference: Appendix 7 (page 2).

* Weights of blends recorded at Harnai Mills did not include weight of oil and water added during blending. These weights should be added to the actual weights of raw materials used to obtain the total weight of a blend for yield and waste calculation purposes.

b) Weight of one blend for				
Khaki overcoating cloth	* 5,300 Kg	Yield		Yield
Weight of yarn after spinning	4,540 Kg	85.66%	Yield	81.34%
Weight of yarn after winding	4,311 Kg		94.96%	
From that blend				
Condenser (slubbing) waste		290 Kg	=	5.47%
Hard (thread) waste		229 Kg	=	4.32%
**Visible waste (sweepings)		200 Kg	=	3.77%
**Invisible waste ("fly", throw-away)		270 Kg	=	5.09%
		989 Kg	=	18.65%

* Weights of blends recorded at Harnai Mills . . . as in Item (i), Entry (a) above.

ii) The writer observed that in

a) carding - there was too much "fly" deposited on the carding machines and too much "droppings" under the machines,

b) spinning - on many occasions the operatives were taking off - from the delivery drums of ring spinning frames and mules - the condenser bobbins too soon i.e. bobbins which had a comparatively large amount of slubbing wound on thus making unnecessary condenser (slubbing) waste,

Continued...

XIII. WASTE CONTROL

c) winding - some weft pirns had incorrectly formed bunches at the bases of pirns and/or the weft pirns were wound too softly thus causing unnecessary hard (thread) waste,

d) weaving - in many instances weavers were taking out from the shuttles the weft pirns which still had a comparatively large amount of weft yarn wound on thus making unnecessary hard (thread) waste. Furthermore, if the number of loom stoppages to replenish weft pirns is reduced the output from weaving department will be increased.

e) milling - there was an excessive "flocking" i.e. loss of fibres during milling of pieces which was an unnecessary loss of raw materials that was used in a blend.

iii) On one occasion

a) The writer found in a corner in greasy burling and mending department a pile of small pieces of milled G.S. blanket cloth which had holes or had damaged selvedges. As an example, if there were 6 (six) or 8 (eight) pieces of average length of 3/4 (three quarters) metre each, the calculation is simple 8 x 75 cm = 600 cm. Length of 1 finished G.S. blanket was 90 inches. Thus $\frac{600}{2.54 \times 90}$ = 2.62 say 2 blankets @ Rs. 117. - (selling price excluding Excise Duty) = Rs. 234 (two hundred and thirty four rupees) was wasted or, at best, the recompense was very significantly reduced because the monetary value of small blanket prices for pulling and re-processing is very low,

b) A milled piece of Khaki overcoating cloth (piece Nr. 4037) was taken out from a milling machine. One selvedge was ripped in 3 (three) places and the damaged lengths were 56", 24" and 20". The calculation is simple, 56 + 24 + 20 = 100 inches x 2.54 = 254 cm say 2½ (two and a half) metres @ Rs.93.25*** = Rs.233.13 say Rs.233 (two hundred and thirty three rupees) was wasted; or - at best - the recompense was very significantly reduced because the monetary value of small pieces of Khaki overcoating cloth for pulling and re-processing is very low,

*** price per metre F.O.R. destination was obtained from the Sales Office at Harnai Mills on 25 March 1986.

NB: Matters relevant to the amount of waste made in various departments are also dealt with in Part VIII. "Production techniques and processing routines (past, newly-implemented, and recommended)" under respective Points.

3. Recommendations

It is recommended that

i) the amount of every type of waste that has been made currently - in every department - at Harnai Mills can and should be reduced immediately by 25%

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(twenty five percent) and further reductions should be aimed at. Some waste such as damaged parts of the pieces in milling should be eliminated completely.

The amount of waste that is made can be reduced by:

a) As frequent as necessary issuing of appropriate instructions to every operative by the supervisory and technical Staff,
b) Much stricter on-the-floor supervision,
c) Improved maintenance (preventive and running) of every machine,
d) In-plant training of fitters/tuners and operatives in every department,
e) Introduction of improved and/or new production techniques and processing routines.

ii) An appropriate, much stricter and "tailor-made" waste control system and methods of recording waste should be devised and implemented. This exercise can best be carried out and the required results achieved only:

- during on-site mission,
- in co-operation with the supervisory and technical Staff,
- by preparing and issuing to every member of the plant Staff concerned (supervisory, technical, clerical) of a small manual containing specific information on how to plan and control production, and how to reduce waste, on factors influencing the quality of semi-finished and finished product stating causes of faults and remedial actions to be taken to prevent defects,
- with concurrent devising and implementing of:

  a) an appropriate record-keeping system throughout the plant,
  b) an appropriate production planning and control system,
  c) an appropriate quality control and quality testing system.

XIV. MANAGEMENT

1. General remarks and prevailing situation

A certain continuity of professional top management is vital for any company and it is particularly so in the case of Harnai Mills where very frequent top management changes are one of the main reasons why Harnai Mills were found by the writer to be in a very grave situation up to 10 April 1986 when the new Managing Director arrived at the Mills. Reference: Appendix 58.

The writer understood that previous Heads of Harnai Mills with the exception of the last appointee were transferred to take up higher positions within PIDC or left to join the private sector or other organizations or started their own businesses or left for other reasons.

The writer also understood that there has been a shortage of technically qualified (in wool textiles) and experienced executives who would be interested in taking up an appointment at Harnai Mills due the remoteness of the location and possibly the circumstances under which Harnai Mills have to operate. It is therefore difficult to find a suitable person who would head Harnai Mills permanently or at least for a period of 5 (five) years to provide more continuity of top management than has been the case during the past years.

Top management is crucial for Harnai Mills during the next few years and steps had already been taken by PIDC to remedy the situation, in the long term, by placing an advertisement in the press as well as contacting a Government Department with the view to a suitable person being seconded to Harnai Mills.

The writer considered it a privilege to have been asked by the Chairman and the Director Finance, PIDC, to participate in interviewing applicants for the post of Project Manager for Harnai Mills, on 15 April 1986 in Quetta.

Unfortunately, there was only one applicant for the post of Project Manager who - in view of his age (twenty eight), lack of any textile qualifications as well as lack of any practical experience in textiles - was totally unsuitable for the post of Project Manager for Harnai Mills.

During the writer's mission it was obvious that there was too large a management gap between the top management (the then Project Manager and subsequently the recently-appointed Managing Director) and the supervisory and technical Staff. In consequence the then Project Manager and then the Managing Director inevitably became involved in too many details of the day-to-day running of the plant - details which should have been dealt with by a Production Manager or a Technical Manager. For example, the writer discovered that the then Project Manager's signature was required in the greasy cloth

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inspection book whenever a piece was light in weight; and the then Project Manager was directly in charge of the construction gang (masons, etc.).

Such matters take time and unavoidably distract attention of the top man who ought to concentrate on the most important matters such as mill policies, financial matters, raw material supply and the overall performance of the mill. With the further commitments to increase production, improve quality and the introduction of systems for production planning and control, quality control, waste control and a possible re-equipment of the Woollen Section the top man should be freed from involvement in day-to-day detail.

2. Recommendations

i) It is recommended that as soon as possible the middle management level such as Production Manager or Technical Manager should be established together with the line-and-staff structure as shown in Appendix 59.

ii) The writer understood that the incumbent Managing Director of Harnai Mills wishes to return eventually to the appointment he held prior to being transferred to Harnai. It was inevitable that the question of management of the Mills arose as one of the topics during the writer's discussions with the Managing Director who outlined a possibility of transferring to Harnai Mills some persons from other mills within PIDC who could work under the supervision of the present Managing Director.

One person could eventually take over Harnai Mills as Managing Director - subject to his performance. In turn, that person could further assess and groom a candidate (preferably a local man) selected from the existing Staff of Harnai Mills or from outside - e.g. from a Government Department or from PIDC or from private sector of industry or commerce - for the post of Production or Technical Manager. But not having worked with persons from other PIDC's mills the writer can only suggest that serious consideration is given to such a solution. Some incentive such as extra financial reward in the form of a bonus based on Harnai Mills' performance or upgrading of official status or other should be given to encourage a suitable person to stay at Harnai Mills.

3. Alternative recommendations concerning top and middle management

If there are any difficulties in finding a future top man for Harnai Mills the writer recommends that consideration is also given to finding and appointing a technically qualified and well experienced (in wool textiles) man - in the age bracket 45 (forty five) to 55 (fifty five) - from abroad, preferably Great Britain, for a minimum period of 3 (three) years and possibly longer. During

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that time a candidate could be selected from the Staff of Harnai Mills or from outside, preferably a Baluchistani, for training and grooming for the post of Production or Technical Manager.

To attract the right calibre of a man from abroad to head Harnai Mills the official status of the appointee would have to be Managing Director or at least General Mill Manager and some special incentives given e.g. attractive salary, free return air ticket to country of origin at say 12 (twelve) months intervals, etc.

The matter of future top and middle management for Harnai Mills is also referred to in Part XVI. "Line-and-staff structure. Job descriptions" and in Part XV. "Personnel", Point 2.1 "Supervisory and technical staff" and Point 3. "Recommendations concerning transfers, upgrading and/or rewarding", Entry (i).

XV. PERSONNEL

1. General remarks

Effective personnel, good motivat.. and personal commitment to a job, self-education, encouragement by the company and rewarding of the well-performed duties are essential ingredients for a success of any organisation. In the case of Harnai Mills these matters are of great importance and it is particularly necessary to reward and encourage deeper personal commitment.

2. Prevailing situation and recommendations

2.1 Supervisory and technical Staff

Supervisory and technical Staff have good practical experience (gained in Harnai Mills and/or in other mills) sufficient to maintain satisfactory quality and quantity output in their respective departments. Their theoretical technical knowledge should be improved by encouraging self-education and this matter is dealt with in Part XIX. "Technical and commercial information at Harnai Mills".

Some of the Staff had attended courses at establishments of technical education in Pakistan and had gained some formal qualifications.

At the beginning of the writer's mission the overriding factor affecting adversely the quality and quantity of semi-finished and finished products as well as amount of waste produced in each department was low motivation and insufficient involvement by the Staff. Most of the Staff were apathetic and either not interested in introducing changes or not able to make improvements. Apart from 3 (three) or 4 (four) exceptions, personal interest in and commitment to a job was greatly lacking, particularly on-the-floor supervision of the operatives.

The Staff should spend more time watching, instructing and correcting any mistakes or incorrect working practices of the operatives. The Staff's involvement improved slowly during the mission and a very noticeable change took place after the arrival of the newly-appointed Managing Director. But in view of Harnai Mills' potential the existing Staff can and should improve themselves further their own "quality" and "value-for-money".

Winding, warping and weaving were the areas where, subject to a deeper personal commitment, the greatest number of changes and/or improvements could have been made - and should be made in the immediate future - without any "money from Karachi". The same comment applies to the areas of inspection, burling and mending of greasy cloth.

Continued...

XV. PERSONNEL

Some of the members of Staff had knowledge of spoken and written English to various degrees. Their knowledge of English had improved noticeably by the end of the recent mission - the writer purposely did not learn any Urdu to indirectly compel the Staff to improve their English so that they could increase their learning potential of technical and commercial matters when some literature is available at Harnai Mills.

Considering the necessity to establish, in the very near future, the middle management level at Harnai Mills - in the writer's judgement based on his work at the Mills - there was unfortunately no one suitable who had the prerequisites such as personality and attributes as well as a certain minimum level of formal qualifications in textiles combined with practical experience in manufacturing and management that were necessary for an immediate promotion to middle management level.

Deeper commitment by the Staff could be encouraged through improved maintenance of their homes being done by the Mills, by providing a more congenial Club House facilities, and by installing a "Suggestions Box" in the mill. Suggestions leading to upgraded quality and/or increase in output without any cash being spent by the management could perhaps be encouraged by some small, immediate cash prize being given to the person who made the suggestion.

One person told the writer that it was difficult to feel fully committed when his wife and children were cold in the winter because the electricity supply was at certain times not available for heating.

2.2 Operatives

Operatives were good but needed more work discipline in various instances (e.g. less walking about and less talking away from their machines). Young and middle-aged generations were quick and willing to learn but needed more instructing and supervision. For example, on many occasions when the writer corrected, instructed (in a sign language) and showed a weaver on one loom that the "crossed" ends should be straightened out, slack ends tightened up, slubs removed, correct knots with short ends should be tied, weft pirns should not be used as "spare" ends to piece a broken warp thread the other weavers noticed what was going on and often corrected themselves whatever needed to be done. But there was a conspicuous absence of the supervisory and technical Staff in the weaving shed to see that faults should have been corrected. However, the main point is that with a stricter on-the-floor supervision in the winding and warping areas many of these faults should not have been allowed to occur in the first place. Further reference to the matter is made in Part VIII. "Production techniques and processing routines (past, newly-implemented, and recommended)", Points dealing with winding, warping and weaving.

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XV. PERSONNEL

The number of operativeswas excessive (particularly in carding, spinning, winding, warping and weaving) in comparison with mills having similar machinery and making similar products in other countries. It is therefore recommended that in the event of an increased production and/or possible start of a 3 (three) shift work in carding, spinning and winding the new operatives are not engaged but the duties of the existing operatives are re-allocated - this ties up with the exercise of devising and implementing Job Descriptions.

If 25 (twenty five) Okuma looms, 10 (ten) Saurer looms and 10 (ten) Hattersley looms are going to be working it will be necessary to have the equivalent number of weavers plus say 10% (ten percent) to allow for absences.

It is also recommended that as a matter of the personnel policy any required reduction in the number of operatives should be achieved by encouraging people over 65 (sixty five) years old to retire and not by dismissals.

3. Recommendations concerning transfers, upgrading and/or rewarding

It is recommended that

i) Mr. Malik Mir Zaman, B.A. (University of Baluchistan), Junior Officer, Stores, grade E1, during the writer's recent mission should be officially transferred to Styling and Designing Function, be de . gnated as Trainee Cloth Designer and promoted to grade E2 as the training and future work in cloth styling/designing is much more demanding than his past work in the General Stores.

A Cloth Designer in any woollen or worsted mill must fulfil successfully important duties and the personality, the ability to mix with people not only in the mill but also with any existing and potential clients, various attributes, any academic qualifications, any practical experience and the knowledge of English of any potential candidate have to be considered.

Basing it on contact with Mr. Mir Zaman as In-charge of the General Stores the writer judges him to be the most suitable man amongst Harnai Mills' present Staff for training in cloth styling/designing which involves the broad aspects of cloth manufacturing. He is - in the writer's opinion - a candidate for training in cloth styling/designing, cloth manufacture and in mill management at a College of Higher Education or a Polytechnic in Great Britain from about October 1987 to July 1988 so that upon successful completion of a course he will be employed as the Cloth Designer at Harnai Mills.

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The matter of training is also dealt with in Part XX. "Cloth styling and designing function" and Part XXXI. "Assistance from the United Nations Industrial Development Organization", Point 4.2 "Recommendations concerning two scholarships", Item (i).

Mr. Mir Zaman holds also a certificate from the Pakistan Institute of Management stating that he participated in "Supervisory Skills Development Course" in Quetta from 9-5-1981 to 14-5-1981. He had also worked abroad (Iran) for a period of time and his spoken and written English is good enough to enable him to benefit fully from the theoretical training in Great Britain. Photostats of his degree, certificates and testimonials are enclosed as Appendices 63/1 to 63/10.

He was somewhat hesitant to switch over from the Stores to Cloth Styling and Designing Function as he thought that if a decision is made to discontinue styling and designing he would be left without a job, and he said so to the writer. There was also some pressure on him by the Deputy Weaving Master and the then Project Manager and opposition to the writer training him in styling and designing which the writer had resisted and overcome. In the writer's opinion it would be a waste of human resources if Mr. Mir Zaman is left to continue to be in charge of the Stores.

If for any reason Mr. Mir Zaman does not pursue his in-plant self-training in cloth styling and designing the writer recommends that Harnai Mills should engage from outside a qualified man with some practical experience in the designing of woollens and worsteds to be the Cloth Designer.

Furthermore, subject to Mr. Mir Zaman's performance since the writer's recent mission, during the possible second mission to Harnai Mills and subject to PIDC's and Managing Director's decision regarding future top and middle management for Harnai Mills it is recommended that Mr. Mir Zaman should - after January 1987 - be put "through the mill" namely work as an operative on every machine in each department starting with the cleaning of each machine in every department and then assisting every Departmental In-charge and afterwards work in the Production Office. Such training would give him a very good practical experience, particularly if PIDC decide to develop and groom him for the post of Production Manager or Technical Manager and possibly a future Managing Director of Harnai Mills.

The writer observed Mr. Mir Zaman during January, March and April 1986 and instigated discussions on several occasions. Depending on his future performance it is estimated that he would be ready to be the top man at

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Harnai Mills by 30 April 1993 at the age of 40 (forty) or to take the post of Production or Technical Manager at an earlier date.

Confirmation or withdrawal of the above stated recommendations will be submitted after the possible second mission and the writer will be glad to discuss in more detail - with PIDC and with the Managing Director - the matter of cloth styling and designing, and future top and middle management, if required.

ii) Mr. Aurang Shah, Foreman in worsted spinning, and Mr. Tayyab Shah, Foreman in weaving during the writer's mission should be officially transferred to Cloth Styling and Designing Function, be designated as Trainee Assistant Cloth Designers and - if not already grade 1 - be promoted to that grade as the training and future work in cloth styling/designing is much more demanding than their past work in production.

There is a need to train a total of 2 (two) or 3 (three) persons in cloth styling/designing. As there were no suitable persons in addition to Mr. Mir Zaman with respect to combined prerequisites of personality, ability to mix with people at all levels, attributes, formal qualifications, practical experience and sufficient knowledge of English for training in cloth styling/designing the writer accepted Messrs. Aurang Shah and Tayyab Shah upon insistence by the Deputy Weaving Master and the then Project Manager.

Mr. Aurang Shah appeared to progress moderately well in his new duties of learning but his and Mr. Tayyab Shah's progress was very slow due to their very poor knowledge of spoken and written English. When the writer insisted that it is necessary to have a fairly good command of English to benefit from training and therefore they should have some private tuition in English for their own benefit they kept giving various excuses for not being able to have a private tutor.

They both hold a Provisional Certificate from the Govt. Wool Spinning & Weaving Department-cum-Training Centre Jhang City Punjab stating that they have passed Diploma/Certificate course in Wool (Textile) Technology.
Reference: Appendices 64/1 and 64/2.

On the basis of their initial performance in cloth styling/designing and other work with the writer during the recent mission, the writer could not support - at the present time - their candidature for training abroad in styling/designing under the auspices of UNIDO. In the event of the second

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mission to Harnai Mills the writer will continue their in-plant training so that they should become good "second men".

If at any time in the future it is necessary to reduce the number of trainees in cloth styling/designing it is recommended that Mr. Tayyab Shah is the first one to return to his previous duties in weaving.

iii) Mr. Mohammad Shaees Khan, Electrical Foreman, grade E1 during the writer's mission should be officially designated as Works Engineer and promoted to grade E2.

He should be in charge of all workshops, all auxiliary installations and all maintenance matters concerning mill buildings, mill yard, office buildings, houses in the Mills' Colony, Club House, Dispensary and Guest Houses including responsibility for the construction gang and sweepers who are not on the payroll of individual departments. It would mean that one person should be in charge of Mill Engineering and Services, and the present Managing Director or the future Production/Technical Manager would have to deal directly with one person only.

The matter of the current condition and maintenance of premises and installations is dealt with in Part V. "Condition of workshops, auxiliary installations, weight scales, measuring devices, and their maintenance" and Part VI. "Condition of mill buildings, mill yard, houses in the Mills' Colony, Club House, Dispensary, Guest Houses, and their maintenance".

Being in charge of Mill Engineering and Services means a much greater responsibility and much more demanding work than being in charge of Electrical Workshop and electrical installations. Basing it on contact and work with Mr. Shaees Khan during January, March and April 1986 the writer judges him to possess the attributes necessary for leadership and to be the most suitable man amongst Harnai Mills' Staff for the post of Works Engineer. He knew and was interested in matters outside the scope of Electrical Workshop.

The writer understood that Mr. Shaees Khan is a Licentiate in electrical engineering and in the past had worked also in the Administration Offices of the Mills.

It is recommended that Mr. Shaees Khan attends a course covering mill engineering and services at a College of Higher Education or a Polytechnic in Great Britain from about October 1987 to July 1988 to gain a wider theoretical knowledge of all matters concerning the maintenance of premises and the operation of mill's installations in view of the recommended 3-Stage Plan for Harnai Mills.

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Mr. Shaees Khan's spoken and written English is sufficiently good to enable him to benefit fully from the theoretical training in Great Britain.

The matter of training is also dealt with in Part XXXI. "Assistance from the United Nations Industrial Development Organization", Point 4.2 "Recommendations concerning two scholarships", Item (ii).

Confirmation or withdrawal of the writer's recommendation for training in Great Britain will be made after the possible second mission to Harnai Mills.

The writer realizes that there may be some friction and a possible disturbance if the Electrical Foreman is promoted over the Assistant Electrical Engineer who according to conventional rules would have been made the Works Engineer. It may therefore be possible to prevent an awkward situation by transferring the Assistant Electrical Engineer to another mill within PIDC or assign him to some special duties away from Harnai Mills prior to appointing Electrical Foreman as the Works Engineer.

N.B. If Mr. Mir Zaman and Mr. Shaees Khan are trained in Great Britain at the same time, it is recommended that they should attend courses at Colleges of Higher Education or Polytechnics in different towns. Thus they would be compelled to speak English all the time and would therefore gain a much better knowledge of English and have more practice in speaking English which are necessary for a Cloth Designer and for a Works Engineer.

iv) Mr. Divan Shah, Assistant Spinning Master, grade E2, in charge of wool scouring and drying, blending, carding and spinning during the writer's mission should be promoted to Deputy Carding and Spinning Master, grade E3, in wool scouring and drying, blending, carding and spinning.

He was interested in improving production techniques and processing routines in his departments, was receptive to proposals and carried out writer's requests. Mr. Divan Shah has good practical experience but did not study textile technology at school. The writer understood that he is a native of Harnai, has been with Harnai Mills since 1953 starting as helper during erection and has been Assistant Spinning Master since 1978.

v) Mr. Abdul Rab, Foreman (General Maintenance) in blending and carding, grade E1 during the writer's mission should be promoted to Assistant Carding and Spinning Master, grade E2, in wool scouring and drying, blending, carding and spinning.

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He was interested in improving production techniques and processing routines in his areas, was receptive to proposals and carried out writer's requests very quickly. Mr. Abdul Rab has good practical experience and the writer understood that he has been with Harnai Mills for some time.

vi) Mr. Faquir Mohammad Shah, Assistant, Stores, during the writer's mission should be promoted to Junior Officer, Stores, grade E1 and take charge of the General Stores as a successor to Mr. Malik Mir Zaman. Mr. Faquir Mohammad Shah was responsive, carried out writer's requests and it is understood that he has been with Harnai Mills for 18 (eighteen) or 14 (fourteen) years.

vii) Mr. Gulla Khan, Assistant Foreman (General Maintenance) in carding during the recent mission should be rewarded in some way. The writer took notice that he worked diligently in spite of his disability (walks with crutches due to part of one leg missing). The writer understood from the Assistant Spinning Master that Mr. Gulla Khan is a good worker.

viii) Mr. Syed Aziz Shah (Internal Auditor), Mr. Mohammad Hanif Khan (Junior Officer, Administration) and Mr. Bangul Khan (Junior Officer, Sales) willingly provided the information in their respective fields of activities whenever the writer asked for any information needed.

XVI. LINE-AND-STAFF STRUCTURE. JOB DESCRIPTIONS

1. General remarks and prevailing situation

An appropriate line-and-staff structure and well defined duties, responsibilities and authorities are vital elements of effective functioning of any organisation whatever its size and products.

In the case of Harnai Mills there were no clearly defined guidelines to be adhered to e.g. the writer was told that one foreman working on the general shift checked the quality of cloth and the maintenance of looms, another foreman in weaving on shift "B" was setting up workers, carried out general supervision of the workers, also checked defects in looms, checked ends and picks per inch in looms and assisted in designing.

It was found that some members of the supervisory and technical Staff were involved in too many jobs with the result that specific tasks which had a direct and great influence on the quality and quantity of output did not receive proper attention, and the supervision of operatives was not sufficient. For example, it should not be the duty of any foreman in weaving to assist in the designing. Furthermore, it was not clear in what way the foreman working on shift "B" assisted in designing as there was no Cloth Styling and Designing Function as such at Harnai Mills at that time. And information concerning yarn and cloth parameters for G.S. blanket cloth, "Rainbow" blanket cloth and Khaki overcoating cloth had to be obtained from the other foreman in weaving who worked on the general shift who quoted it "off the cuff" without showing any written records, which fact was wrong as such records should have existed. Reference: Appendix 71.

The writer was told that Mr. Mohammad Saeed was in charge of weaving and also did the designing. It should not be the duty of the Deputy Weaving Master to do the designing. He should concentrate on the quality and quantity of output, supervision of personnel, supervision of the condition of machinery and equipment and all other matters concerning winding, warping, reaching-in and weaving.

When trying to obtain information about who did what with particular reference to any line-and-staff structure the writer was given different details on every occasion. The designations varied and the line-and-staff structure was not clear. The diversity of information concerning line-and-staff structure is illustrated in Appendices quoted below.

The 2 (two) posts of Deputy Manager (Production) and Deputy Manager (Quality Control) shown in Appendices 61/2 and 61/3 are not shown in Appendices 61/1 and 61/4, 80/3 and 80/8.
The post of Weaving Master is shown in Appendix 61/4 and Deputy Weaving Master is shown in Appendix 80/3 but is not shown in Appendices 61/1, 61/2 and 61/3.

The post of Quality In-charge shown in Appendix 80/8 is not shown in Appendices 61/2, 61/3 and 61/4.

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The writer asked all Departmental In-charges and Foremen to come to a meeting just before leaving Harnai Mills for UNIDO, Islamabad and PIDC, Karachi on 31 March 1986 to discuss matters of common interest and to advise them that the writer would be away for a few days.

During the meeting they were asked to complete a form so that the writer could have had specific information as to who was responsible for what. Reference: Appendix 62.

They did not wish to fill in the form without first speaking to the then Project Manager who was away on private leave. The writer fully understood and approved their decision. That form could serve as a basis for future Job Descriptions.

In the event of the second mission to Harnai Mills the writer will - if required - assist the Managing Director in preparing the Job Descriptions and/or in assigning the duties.

2. Recommendations

It is recommended that

i) As in Part XIV. "Management", Point 2, "Recommendations", Entry (i) i.e. ..."as soon as possible the middle management level such as Production Manager or Technical Manager should be established" and the line-and-staff structure as shown in Appendix 59.

The Production Manager or Technical Manager whichever title is preferred should have some formal qualifications in textiles and some practical experience in manufacturing and management. He should be responsible for the day-to-day effective operation of the plant and report directly to the Managing Director.

The supervisory and technical Staff should report to the Production Manager or Technical Manager with the exception of Cloth Designer. The Cloth Designer should report directly to the Managing Director.

ii) Job Descriptions should be prepared - in consultation with every person concerned - and issued to each employee, at every level, below the rank of Managing Director starting with gardeners, sweepers, peons, helpers, through clerks, foremen, Departmental In-charges up to and including Production Manager or Technical Manager.

In some cases, narrowing or widening of the areas of duties and responsibilities with concurrent decrease or increase of authority is necessary. Precise definitions of the duties and the responsibilities - and their allocation to every person concerned - will

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result in the needed, much stricter on-the-floor supervision and better maintenance of machinery, auxiliary installations and buildings. Thus improved quality of semi-finished and finished products as well as high output will be achieved from every department both with the existing and the future resources available at Harnai Mills.

Members of the supervisory and technical Staff should co-operate very closely with each other but should not intervene in the departments for which they are not responsible. If they see anything wrong in any department other than their own they should tell the respective Departmental In-charge who in turn should correct the matter or issue relevant instructions.

The way the Job Descriptions are prepared and the manner in which they are adhered to can make or break the operation of Harnai Mills.

iii) Some time in the future - subject to the improvements implemented in the mill and greater personal commitment by the supervisory and technical Staff - a new nomenclature is introduced to describe specific posts. The writer understands fully that the present terms are based on tradition but it is felt they will be somewhat antiquated when production and responsibilities are increased, and Harnai Mills are modernized. The recommended and internationally accepted titles are stated against the existing titles. New titles have been added. These changes should also boost morale and induce further personal commitment.

Current title	Recommended title
Managing Director	Managing Director
Production or Technical Manager	Mill Manager
Assistant Spinning Master	Carding and Spinning Manager
Deputy Weaving Master	Weaving Manager
Foreman Dyeing	Dyeing Manager
In-charge Finishing	Finishing Manager
In-charge Quality Control	Quality Control Manager
In-charge General Stores	General Stores Manager
Assistant Electrical Engineer	Works Engineer
Foreman (Weaving or Spinning etc.)	Foreman (Weaving or Spinning, or etc.)
Non-existent post	Manager (Marketing and Sales)
Non-existent post	Deputy Manager (Marketing and Sales)

XVII. PERSONNEL FUNCTION AND SECURITY FUNCTION

1. General remarks and prevailing situation

Good industrial relations based on a sound personnel policy - along with the necessary improvements in quality and quantity of output - will help considerably Harnai Mills not only to regain a good reputation but will also make the personnel more contented and efficient considering the isolation of Harnai and the existing situation at the Mills. Human resources in terms of supply of the local labour force, be it unsophisticated or untrained force, are a very valuable asset of Harnai Mills.

During the writer's recent mission there was no person directly concerned with or responsible for personnel matters.

Security against fire and the possibility of damage to or misuse of the mill premises have to be considered in the context of the Security Function which should be strengthened and well defined.

Either one or two watchmen always sat near the mill gate and there was a security office near the mill gate but it appeared that its main function was to watch the gate.

When the writer wanted the mill yard to be hosed with water to clean it up before scoured wool was going to be spread for drying (in any case this must not be the practice) it was discovered that the only hydrant was near entrance to carding and was not working due to broken valve. A new valve was found in the General Stores. Water hose was stored on a shelf in the General Stores (the General Stores were open only during the general shift, 8.00 to 16.00 hr). New valve was fixed willingly and water hose was hung on a peg in the wall near the hydrant by the Electrical Foreman.

2. Recommendations

It is recommended that an appropriate Personnel Function and Security Function are established and an Assistant Manager (Personnel and Security) or similar is appointed in charge of the Personnel Function and the Security Function.

2.1 Personnel matters

Personnel and Security Office should deal with matters such as:

i) Purchasing and issuing to every employee from Assistant Foreman downwards of 1 (one) overall to start with (at a later date when financial situation is improved a second overall) to be worn during working hours. It is dangerous to wear loose clothing such as the national dress whilst working near the moving parts of the machines or climbing ladders to do any repairs. Overalls being the property of Harnai Mills should not be permitted to be worn as private clothing outside working hours and should be taken off when leaving mill and be left in the mill (once a month or

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so 1 (one) operative should wash in the scouring section all the overalls),

ii) Wearing of a large head cover should be discouraged for personal safety reasons but the writer fully understands that it is a local custom to do so which may have to be observed,

iii) Establishing and running a canteen within the mill premises where cheap meals could be served during mealtimes and tea made when required thus saving time when the operatives have to go outside to bring tea,

iv) Establishing and supervising a punched-card system for clocking-in and clocking-out which should be established to improve work discipline and prevent unauthorized going out during working hours. All employees from Assistant Foreman downwards should be clocking-in and out. The writer is aware that currently employees have to obtain a pass from the respective Departmental In-charges to leave mill premises but there is no checking how long an employee is away. An incentive scheme to reward punctuality and regular attendance should be established,

v) Employees over the age of 65 (sixty five) should be encouraged to retire but should not be dismissed if they are good and loyal employees,

vi) Fixing, and updating, of a large notice board to the wall near the entrance to carding department (wall which separates blending from the entrance) on which notices concerning all employees should be pinned e.g. working times of shifts "A", "B" and general shift, mealtimes, bonuses, organizational chart, etc,

vii) Devising and distributing to every employee including Departmental In-charges a set of rules for machinery attendants impressing safety during work and stating precautions which must be taken when working near moving parts of machinery or belts, handling dangerous chemicals, etc. The writer had seen an operative climbing onto a carding machine to remove "fly" and cleaning dirt whilst the machine was running at full speed,

viii) Co-operate with the Mechanical Workshop and the respective In-charges in the installation - which should be implemented in the near future - of machinery guards screening moving belts next to passagewalks, rotating eccentrics of the condenser ends of the carding machines, wire nets screening a shuttle box to stop a shuttle flying out (but a shuttle will not fly out if the loom is tuned and maintained properly), etc,

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ix) Taking overall responsibility for in-plant training by TIRDC's Instructors of instructors of fitters/tuners and instructors of operatives and the subsequent training of Harnai Mills' operatives.

N.B. The matter of in-plant training is dealt with in part XVIII. "Self-education, in-plant training and training abroad", Point 4. "In-plant training", (4.1 "In-plant training in spinning department" and 4.2 "In-plant training in other departments").

2.2 Security matters

It is recommended that

a. i) At least 2 (two) more hydrant points should be installed
- 1 (one) near the wall of the main building somewhere opposite the entrance to Excise warehouse,
- 1 (one) near the wall of the building where sales, administration and general offices are located,

* ii) Fire-fighting equipment should be located at strategic points throughout the premises,

* iii) Fire extinguishers (foam type) should be fixed to the walls inside the buildings at strategic points,

* iv) Some employees should be trained in fire-fighting and have regular drills.

*Advice and specific instructions should be obtained from the Fire Service Authorities so that Harnai Mills can comply with the official regulations.

b. i) Smoking should continue to be allowed in any office throughout the premises but smoking on the shop floor must not be permitted in any department due to fire hazard. On one occasion (at 17.30 hr when supervision was much slacker) the writer smelled cigarette smoke near one of the woollen ring spinning frames and on second occasion (at 17.45 hr) an operative was smoking outside the weft store in the winding area,

ii) "No smoking" signs in English, Urdu and Pashto, if needed, should be painted on some of the walls at clearly visible places in each department.

c. i) In order to save energy all the lights in any department that is not working should be switched off. On Friday, 24 January 1986 at 11.00 hr when the writer went in the mill and only milling section was working, all the lights in other departments were also lit.

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2.3 Other matters

Any other matters required by the Managing Director.

3. General

It is recommended that the Managing Director should contact and obtain from the Inspectorate of Factories or other Government Department a set of official regulations in force in Pakistan and governing safety at work and safety of the premises.

XVIII. SELF-EDUCATION, IN-PLANT TRAINING AND TRAINING ABROAD

1. General remarks

Any company, whatever its size and activities, always benefits from each employee's competence derived from practical experience and based on technical and commercial theoretical knowledge gained through education at some teaching establishment and supplemented by self-education.

2. Prevailing situation and recommendations

In the case of Harnai Mills - because of the Mills isolated location - it is particularly necessary that self-education amongst supervisory and technical Staff should be facilitated and encouraged, the in-plant training of fitters/ tuners and operatives should be extended, and training abroad for suitable candidates from supervisory and technical Staff should be provided.

3. Self-education amongst supervisory and technical Staff

Self-education amongst supervisory and technical Staff should be facilitated, encouraged, and rewarded in some way, however small, by the Managing Director. For example, two members of the Staff were very interested in information brought by the writer and in gaining more technical knowledge by asking questions. The matter of self-education is further dealt with in Part XIX. "Technical and commercial information at Harnai Mills".

4. In-plant training

4.1 In-plant training in spinning department

As far as the writer was aware there was no in-plant training before the following 2 (two) courses which were conducted by the 2 (two) Instructors from the Karachi-based TIRDC under the supervision of Mr. Muhammad Yunus, Head of Spinning Department, TIRDC. Reference: Appendix 65.

i) Training course for 2 (two) instructors of operatives of woollen ring spinning frames - 9 March to 12 April 1986 (full-time, during the general shift) conducted by Humayun Mumtaz. Reference: Appendix 66/1 and 66/2.

ii) Training course for 2 (two) instructors of fitters of woollen ring spinning frames - 3 April to 19 April 1986 (full-time, during the general shift) conducted by Mr. Fazlur Rahman. Reference: Appendix 67.

The trainees were jointly selected by the TIRDC's Instructors and the Assistant Spinning Master from the existing personnel in spinning.

Training consisted of lectures and practical work in the spinning department and the trainees had, at the end of the course manuals with instructions in Urdu.

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During the courses the writer was liaising closely with the TIRDC's Instructors and participated in the test (oral and practical) at the end of the courses.

NB: A Training Centre consisting of one room in a building away from the mill buildings and the Administration Offices was established by the TIRDC's Instructors prior to starting the courses. This Training Centre should be left for use by the future trainees participating in in-plant training courses for instructors of fitters/tuners and instructors of operatives.

In the writer's opinion, both courses were necessary for and of benefit to Harnai Mills and should contribute to the upgrading of skills of the personnel concerned as well as to increasing of output and improving the quality of the yarn produced. The writer is satisfied that within the time limits, the resources and the facilities available on-site both courses were of the standards required.

It is recommended that during October 1986 Mr. Muhammad Yunus of TIRDC visits Harnai Mills for a period of 2 (two) to 4 (four) days to check performance of the recently-trained instructors and the subsequent progress made by their trainees.

4.2 In-plant training in other departments

In the context of Harnai Mills' needs the writer recommends that the following 2 (two) courses are conducted at Harnai Mills by TIRDC's specialist Instructors along similar lines and of similar duration to courses for spinning personnel. It is recommended that these 2 (two) courses are conducted during the writer's possible second mission to Harnai Mills (end of 1986/beginning of 1987). But it is necessary that the writer is given an English translation of any manuals or documents prepared by and/or given to the trainees.

i) A course for 2 (two) instructors of weavers (Okuma looms, Hattersley looms, Saurer looms and Picanol looms) - one common course to train weavers on these looms,

ii) A course for 2 (two) instructors of fitters/tuners (Okuma looms, Hattersley looms, Saurer looms and Picanol looms) - one common course but emphasizing any relevant, specific settings and methods of operation of the looms installed at Harnai Mills.

NB: Operating/service/greasing manuals for Hattersley, Saurer and Picanol looms are now available at Harnai Mills.

Furthermore, it is recommended that during 1987 and 1988 similar in-plant training courses for instructors of fitters and instructors of operatives

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in carding, winding, warping, finishing, and instructors of operatives in whipping (sewing of blankets) are conducted by TIRDC's Instructors.

4.3 In-plant training in cloth styling and designing

The Terms of Reference received from UNIDO, Vienna stated "-prepare a programme for fellowship holders to attend an overseas weaving/design course," and "-evaluate the results of the weaver/designers training abroad...".

As there were no suitable persons with respect to the combined requirements of personality, attributes, technical knowledge, practical experience and knowledge of written and spoken English amongst Harnai Mills' supervisory and technical Staff for immediate training abroad the writer started during March 1986 (with UNIDO's Vienna and Islamabad, and PIDC's Karachi knowledge) in-plant training of 3 (three) persons in cloth styling and designing, structure and properties of fabrics (woven fabrics), yarn and cloth calculations, and keeping of cloth manufacturing records.

The matter of the above mentioned in-plant training is dealt with in Part XX. "Cloth styling and designing function".

5. Training abroad

It is recommended that 2 (two) members of Harnai Mills' Staff are sent abroad for training which should comprise theory and some classes in practical work i.e.

i) One person for training in cloth styling and designing, structure and properties of fabrics (woven fabrics) including background knowledge of woollen cloth manufacturing to be the Cloth Designer,

ii) One person for training in mill engineering and services, and associated matters to improve his present knowledge to be the Works Engineer.

The matters of training abroad and selection of candidates are dealt with in:

a) Part XV. "Personnel", Point 3. "Recommendations concerning transfers, upgrading and/or rewarding", Items (i) and (iii),

b) Part XXXI. "Assistance from the United Nations Industrial Development Organization", Point 4.1 "Prevailing situation" and Point 4.2 "Recommendations concerning two scholarships".

XIX. TECHNICAL AND COMMERCIAL INFORMATION AT HARNAI MILLS

1. General remarks and prevailing situation

A certain amount of technical and commercial information on the on-going matters and developments world-wide - and in a country where the mill is situated - is necessary for any mill to operate profitably. And in the case of Harnai Mills due to the remoteness of the location and the comparatively low level of theoretical knowledge of the Staff technical and commercial information in the form of text books, periodicals and magazines is particularly needed, and reading about new trends and techniques by the supervisory and technical Staff should be encouraged. Up to the time of the writer's recent mission there was no such information available at Harnai Mills.

2. Action taken during the recent mission

The writer specially brought from England a number of books in English which were loaned to members of the Staff for the duration of the mission and a quantity of personal notes (in English) photostats of which were given to various people. Some books were donated to Harnai Mills so that the Staff can widen their theoretical knowledge so that they can make an additional contribution to improving quality and quantity of output.

The details of information which was made available to the Staff are given in Appendix *68*.

Operating/service/greasing manuals and spare parts catalogues for the machines are necessary if a planned maintenance system is to be introduced at Harnai Mills. There were no manuals for some machines and there were no records of what was available. Some manuals were locked in cabinets and keys not available whilst some Staff were away on holidays. The writer obtained in England some manuals. After telephoning machinery makers for various manuals and catalogues, upon returning to Harnai Mills it was discovered that some manuals and catalogues were locked away. The matter of availability of manuals and catalogues is dealt with in the following point 3. "Recommendations".

3. Recommendations

It is recommended that

i) A small library is established (one book case to start with) in the Testing and Quality Control Laboratory where all books and journals should be kept and taken out, upon signing for each item, for reading (outside working hours) by all members of supervisory and technical Staff who are able to read English,

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ii) All operating/service/greasing manuals and spare parts catalogues should be deposited there and then taken out (upon signing) for permanent use by the respective In-charges or Foremen,

N.B. Until the Testing and Quality Control Laboratory is enlarged and refurbished during Phase 2 of Stage 2 of the 3-Stage Plan all books, manuals and catalogues, if not in use, should be kept in the General Stores to facilitate borrowing and avoid possibility of being lost.

List of manuals and catalogues deposited in the General Stores is given in Appendix 69.

The following have been kept by the Assistant Spinning Master:

- Operating manual for Laroche Junior Breaker machine,
- Operating manual and spare parts catalogue for Torigoe card,
- Catalogues of spare parts for "old" Okuma carding machines, "old" Okuma woollen ring spinning frames and "old" Okuma woollen spinning mules,

iii) PIDC or Harnai Mills should start subscriptions to journals listed in Appendix 68. Point 3. "Journals to be provided by PIDC or Harnai Mills themselves" i.e.

- items (i) to (iv) during Phase 1 of Stage 2 of the 3-Stage Plan,
- item (v) during Phase 2 of Stage 2 of the Plan for use by the Marketing, Sales and After-sales Function and by Cloth Styling and Designing Function only.

XX. CLOTH STYLING AND DESIGNING FUNCTION

1. General remarks

Cloth Styling and Designing Function (which should also include new product development) - however small or large - is indispensable for any woollen mill or worsted mill if the mill wishes to produce good fabrics at competitive prices, and be a viable operation.

What is meant by new product development is self-explanatory.

Cloth styling and designing does not comprise merely the use of various colours of coarse or fine yarns, making a cloth in plain weave or in two-and-two twill weave and applying any finishing routine which is thought to be the most convenient at the time, or dissecting a small swatch of fabric which was sent by a prospective customer and reproducing that cloth in any required number of pieces.

In a very broad and true sense cloth styling and designing is a creative type of activity requiring flair, technical knowledge and practical experience. And it involves

- the conception and visualization of a new fabric,
- the selection and use of raw materials with the desired characteristics and properties,
- the choice and use of yarn or yarns (woollen or worsted or other types, and yarn parameters),
- the choice and skilful use of thread interlacing i.e. weave, be it a simple weave or a complicated one,
- the choice and application of parameters for greasy cloth and finished cloth,
- the choice and use of colouration at some stage of processing,
- the choice and application of a specifically chosen finishing routine to produce an attractive product with the required appearance and properties; a product which a customer will want to buy - be it a coarse blanket or heavy overcoating cloth or any type of fine worsted fabric or an exclusive haute couture woollen fabric - not forgetting the processing capability of the machinery that is installed in the mill, and the fact that the price of the finished product must be competitive, and the finished product should be delivered on time.

The organisation of work of developing new products and cloth designing must be kept separate from the organisation of work of improving production techniques and processing routines. Such a division of work is usually necessary for enterprises employing more than ten people.

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XX. CLOTH STYLING AND DESIGNING FUNCTION

Persons concerned with new product development and designing can therefore concentrate on the needs of the market. And those concerned with the production techniques and processing routines can concentrate on problems of manufacturing efficiency, quality during production and minimum unit cost. The development and designing must include a method of manufacturing that is available in the plant and is within a policy of the company, if the new product is to be viable. At the same time the development of new production techniques and processing routines may create possibilities for the development of new products.

New product development and cloth designing should be directly orientated towards the needs of the market and must take into account sales and manufacturing policies of the company. The manufacturing methods must help the development and design and ensure that the finished product is manufactured at the minimum unit cost. In this context product development and designing should have a direct contact with customers on matters of design and market requirements.

Furthermore, the new product development and cloth designing personnel should be able to show production personnel the most economic method of making the envisaged product and, if necessary, develop the best method of manufacturing.

But new product development and designing must always interact with marketing, sales and after-sales function as well as production personnel and co-operate very closely with the top management.

Exact, correct and actual cloth manufacturing details for woollen fabrics and for worsted fabrics constitute one part of the information which is necessary for any woollen and worsted mill to be able to maintain good quality and high output as well as the correct costing of greasy and finished fabrics that are being produced.

2. Prevailing situation and recommendations

Up to 19 March 1986 the Cloth Styling and Designing Function and new product development as such were non-existent at Harnai Mills. The design content of the samples of woollen fabrics and worsted fabrics given to the writer by Mr. Z.I. Bokhari, PIDC, during January 1986 was unsophisticated.

The matters of the then existing styling/designing situation and the selection of candidates for in-plant training are dealt with in:

i) Part XVI. "Line-and-staff structure. Job Descriptions", Point 1. "General remarks and prevailing situation", (2nd, 3rd and 4th paragraphs),

ii) Part XV. "Personnel", Point 3. "Recommendations concerning transfers, upgrading and/or rewarding", Items (i) and (ii).

Continued...

XX. CLOTH STYLING AND DESIGNING FUNCTION

During the first half of March 1986 the "New" Worsted Weaving Office which was allocated to the writer for use during his mission was converted and refurbished to become Cloth Styling/Designing Office in which the following should be kept for reference and be easily accessible whenever needed:

a) Detailed cloth manufacturing details for each type of cloth that is made by Harnai Mills. An example of the details to be recorded is given in Appendix 70.

b) Any designers' blankets and samples of fabrics made by the Mills,

c) Any small swatches of fabrics received as samples from the customers,

d) Details of any cloth analysis carried out for the purpose of reproducing a fabric from a sample sent by a customer wanting that particular fabric,

e) Small, sample hanks of yarns made by Harnai Mills for cloth designers to use during their work,

f) Designer's "tools" e.g. coloured crayons, cloth picker, piece glass, ruler, pocket calculator, point paper i.e. design paper (8 x 8 ruling), desk lamp, pair of scissors, etc.

g) Journals and magazines dealing with fashion and trends in woven fabrics.

Some of the then existing records were insufficient or quoted "off-the-cuff" or non-existent. For example, Government of Pakistan Specification No. P-SG/535(C) for G.S. blankets is not sufficient to satisfy fully the requirement of the contents of any mill's cloth manufacturing details that should be kept.

Some cloth manufacturing details concerning worsted fabrics were written up specially by the Deputy Weaving Master when the writer asked for them. It was later discovered that some such details were kept in the Costing Section of the Accounts Department.

The matter of records is further dealt with in Part X. "Data recording, storage and distribution".

3. In-plant training course (Trainees. Programme. Time-table. Syllabus)

On 19 March 1986 the writer started training Messrs. Malik Mir Zaman (General Stores In-charge) and Tayyab Shah (Foreman in weaving). On 22 March 1986 Mr. Aurang Shah (Foreman in worsted spinning) joined the other 2 (two) trainees.

Their in-plant training programme (theoretical in the office and practical in the mill) consisted of:

i) Reading of relevant passages from the book provided ("Textile Terms and Definitions"),

ii) Studying writer's personal notes on cloth structure and properties of fabrics (woven fabrics), and on cloth styling and designing,

Continued...

XX. CLOTH STYLING AND DESIGNING FUNCTION

iii) Studying writer's personal notes on yarn and cloth calculations,

iv) An introduction to keeping of cloth manufacturing details,

v) Writer's talks and trainees' questions on the subjects (within the writer's time limits in the context of other work in the mill),

vi) Practical work in the mill to gain some practical knowledge of woollen cloth manufacturing processes from blending to finishing.

The in-plant training daily time-table is enclosed as Appendix 72.

The syllabus for the in-plant training course is enclosed as Appendix 73.

The enclosed syllabus is based on the first part of the syllabuses prepared for, submitted to and approved by the Undergraduate School of Studies in Textile Technology and Textile Design, University of Bradford, Bradford, Great Britain.

The subjects taught during in-plant training were:

- Structure and properties of fabrics (woven fabrics), and cloth styling and designing,
- Keeping of cloth manufacturing details,
- Yarn and cloth calculations,
- Very brief outline and sequence of the woollen processes carried out at Harnai Mills.

Photostats of the comprehensive notes on cloth structure and properties of fabrics (woven fabrics), on cloth styling and designing, and on yarn and cloth calculations were given to Mr. Mir Zaman for use by the 3 (three) trainees.

The given notes were used as bases for the writer's lectures during classes in Structure & Properties of Fabrics (Woven Fabrics), and in Fabric Production (Woven Fabrics), for students taking Diploma in Textile Technology (Cloth Manufacture Option) Cour and Degree Courses in Textile Science and Textile Technology (Honours), Textile Design (Honours), and Textile Management (Honours) - 2nd, 3rd and 4th year during academic year 1982-83.

4. General recommendations

In view of the potential market (contract sales to the Government, to various Authorities and the sales to the private sector) and the human, physical and financial resources that are or will be available at the Mills it is recommended that

i) The newly-established cloth styling and designing function whose activities have been - and will be in the near future - limited to in-plant self-

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training of the trainees should continue to exist,

ii) The trainees should continue their in-plant self-training.

N.B. The writer will send - during October 1986 - further personal notes on structure and properties of fabrics (woven fabrics), and on cloth styling and designing to the Managing Director for passing on to the trainees. In the event of the second mission the writer will set up and conduct 3-hour written and 1-hour oral examinations of the trainees to assess their progress.

iii) One of the trainees should be sent for further training in Great Britain. The matters of his training and the alternative are dealt with in:
   a) Part XV. "Personnel", Point 3. "Recommendations concerning...", Item (i),
   b) Part XXXI. "Assistance from the United Nations...", Point 4.2 "Recommendations concerning two scholarships", all initial paragraphs and Items (i) and (iii),

iv) There should always be a close co-operation between the Cloth Styling and Designing Office engaged also in new product development, the Managing Director, the envisaged Production Manager/Technical Manager and each Departmental In-charge.

v) There should be an interaction - at all times - between the Cloth Styling and Designing Function and the Marketing, Sales and After-sales Function when the latter is established.

vi) Innovation should be the main characteristic of Harnai Mills' marketing and manufacturing policies when the cloth styling/designing Staff is fully trained, the marketing, sales and after-sales function is well established and the machinery park is modernized.

XXI. PRODUCT MIX. DEVELOPMENT OF NEW YARNS AND FABRICS. UTILIZATION OF THE OLD STOCKS OF RAW MATERIALS AND YARNS

1. General remarks and prevailing situation

Optimum product mix, development of new yarns and fabrics based on ingenuity in manufacturing and investment in plant, and utilization of any existing old stocks of raw materials and yarns should be one of the basic principles of manufacturing and marketing policies in any manufacturing enterprise.

In the case of Harnai Mills considering all constraints (e.g. old machinery, need for improvement of the Staff's theoretical technical knowledge, etc.) but also advantages (e.g. good supply of labour force, future preferential placement of orders by Government Departments, etc.) the current product mix of 3 (three) types of woollen fabrics is too narrow.

As stated in Part II. "Products, production, resources (plant, raw materials, employees), weaving capacity and machinery general utilization", Point 2. "Weaving capacity," 15 (fifteen) types of fabrics - 10 (ten) types of woollen fabrics and 5 (five) types of worsted fabrics - can be woven at Harnai Mills. The existing carding, spinning (woollen and worsted) and finishing (woollen and worsted) machinery is capable of producing a much wider than the current product mix; the prerequisites being greatly improved maintenance of machinery and much stricter on-the-floor supervision.

In addition to any existing stocks of raw materials that are used for the current production there is a large quantity of old stocks of raw materials and yarns which should be utilized in the development of new woollen yarns and fabrics e.g. stocks of Navy Blue Serge, All Wool 60 White Tops, Woollen Hard, Sliver and Sweeping Waste, Worsted Hard Waste Unpulled, Worsted Hard Waste Dyed, Blue Grey Broken Top, etc., and particularly G.S. Army Blankets Cut pieces (estimated 30,000 (thirty thousand) kilograms).

The book-value or re-sale value of these stocks may be very low or none but if properly utilized the old stocks are a valuable asset, available free, on-the-spot. Reference: Appendix 74.

The writer inspected the Raw Material Stores on several occasions and assessed the contents - some of these old stocks, if left indefinitely in the Stores and if the roof is leaky, will eventually not be good enough for any usage.

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2. Recommendations

To utilize fully the existing human, physical and improved (it is hoped) financial resources at Harnai Mills, the product mix should be gradually widened during Phase 2 (duration of the writer's possible second mission) of Stage 2 of the 3-Stage Plan by starting to diversify to produce new woollen yarns and up-market woollen fabrics.

i) The start of the development of new woollen yarns and fabrics should be concurrent with the establishment of an appropriate Marketing, Sales and After-sales Function, and further in-plant training of the Trainees in cloth styling and designing.

The development and production of any worsted yarns and fabrics should be left in abeyance until early 1987.

The writer brought during the recent mission over 200 (two hundred) samples of commercial yarns and fabrics, including relevant manufacturing details, produced in large quantities in various countries, for demonstration and discussion with the Harnai Mills' Staff to show what can be done by the Mills. But the Mills were found not to be ready for any developments yet. Some of the samples were shown to Mr. Bokhari prior to the writer's departure for UNIDO, Vienna, on 28 April 1986. These samples will be brought again in the event of the second mission.

In the event of the second mission the writer will discuss with PIDC what types of fabrics are suitable for Pakistani market. Alternatively, to obtain specific guidance PIDC could perhaps arrange a meeting with an agent who knows the local market potential, particularly for woollen fabrics.

ii) The writer wanted to utilize some of the G.S. Army Blanket Cut pieces during the recent mission to supplement the then existing stock of components for G.S. blanket cloth or to develop new fabrics and discussed the matter with the then Project Manager as it was necessary to have a rag pulling machine. There was a rag pulling machine at Quaidabad Mills which was sent there by Harnai Mills some time ago. Mr. Abdul Rab, Foreman (General Maintenance) in carding went to Quaidabad Mills to assess the machine. The writer understood that the machine was in a very bad condition and needed many spare parts. It is therefore recommended that a second-hand rag pulling machine - which must be in a very good condition - is bought in Pakistan.

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XXI. PRODUCT MIX. DEVELOPMENT OF NEW YARNS AND FABRICS. UTILIZATION OF THE OLD STOCKS OF RAW MATERIALS AND YARNS

By pulling G.S. blanket cloth pieces and adding say 5% (five percent) of such material to each blend for G.S. blanket cloth currently produced not only the pressing situation of raw material supplies can be made easier but also this material can be used by the writer, in the event of the second mission, for the development of new woollen fabrics.

The writer estimates that the total cost of purchasing and transportation to Harnai Mills of a rag pulling machine will be lower than the usage value of any already existing stocks of rags at Harnai Mills. Future use of the machine would be a cost-free bonus.

N.B. There is at Harnai Mills a good, modern (1976) machine suitable for pulling hard thread waste and rags which is suitable for pulling both types of material under normal circumstances. In the case of Harnai Mills it is recommended that an additional, second-hand, rag pulling machine is bought to facilitate production and avoid frequent adjustment of settings.

iii) The writer already assessed during the recent mission the indigenous Gija wool (mountain wool and lowland wool types) with the view to utilizing these wools for the development of new fabrics such as civilian blankets, civilian overcoating fabrics, furnishing fabrics, etc. But to facilitate the development and to have a scientific basis for processing it is recommended that Harnai Mills - if the Mills are interested - send to the writer, by air freight, at the beginning of November 1986 separate samples of greasy Gija wool (mountain wool) and (lowland wool) of say 2 (two) kilograms each. The writer will have the samples analysed for yield and wool quality (micron). The samples should be representative of the bulk and be drawn at random from say 2 (two) or 3 (three) bales so that they are not specially selected and the wool is neither specially good nor specially bad. If greasy samples are not available, scoured samples should be drawn according to the same principle and will serve the purpose of determining the micron and thus enabling the writer to assess more accurately the spinability limits of Gija wools.

XXII. MARKETING, SALES AND AFTER-SALES FUNCTION

1. General remarks and prevailing situation

In the present day of competitive manufacturing and selling any organisation wishing to make a profit must have an effective Marketing, Sales and After-sales Function.

One of the very well known men in textiles in Great Britain defined marketing as "...disposing of production consistently and profitably by finding out what the consumer wants - or can be persuaded to want - and supplying it. "Can be persuaded to want" is one point of view, but in wool textiles, it is more "What the consumer is likely to want in the future", under the persuasion of fashion". And this is what Harnai Mills need in both short-term and long-term manufacturing policies.

A cursory investigation had shown that the Marketing, Sales and After-sales Function as such did not exist at Harnai Mills. The main role of the Sales Office at Harnai Mills was that of an Order-receiving and Despatch Office.

Currently - as far as the writer was able to ascertain - there was no dialogue with the customers except correspondence relating to complaints from the clients (poor quality of cloth, late deliveries).

Samples of fabrics received by the writer from Mr. Bokhari - some of which were wrongly mounted (back up instead of face up, weft-way instead of warp-way, untidy and not cut properly i.e. not gimped) - are one example of matters which affect adversely both the potential sales and Harnai Mills' reputation.

The writer understood that for some time Harnai Mills have depended entirely on orders from the Government (G.S. blankets), Pakistan Railways ("Rainbow" blankets) and Police Authorities (Khaki overcoating). The writer was told that if 5,000 (five thousand) G.S. blankets are produced per month, the loss on each blanket is about Rs.70.- (seventy rupees). The loss decreases as the number of blankets produced per month increases. Further reference to prices of blankets and losses made in the context of the quantity of blankets produced is made in part XXIII. "Financial situation", Point 1. "Prevailing situation".

The writer understood that PIDC had written to the Government of Baluchistan asking that the orders placed by the Authorities e.g. hospitals, Provincial Police Force, etc. would be directed to Harnai Mills and that the response was positive also that PIDC had approached the Federal Government in search of orders.

Deliveries on time, competitive but realistic prices, efficient cloth manufacturing, effective marketing and new product development - to state it very briefly - are the bases of success, and these have been lacking at Harnai Mills.

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2. Recommendations

It is recommended that

i) Notwithstanding the receipt of any possible orders from the Government, from Pakistan Railways or from Police Authorities and because of a remote location and Harnai Mills' current limited manufacturing capability insofar as product mix is concerned, it is essential that the Marketing, Sales and After-sales Function is established. Appropriate strategies should also be evolved as to where, when and how to sell - competitive but realistic prices should be charged.

ii) The present "firm order" manufacturing policy namely making cloth only against firm orders thus avoiding stock-piling of unsaleable fabrics and tying-up of capital should gradually be changed to a policy with emphasis on fabrics which would create demand for Harnai Mills' products. It is much more profitable to create a specific demand and to supply it in advance of one's competitors than to supply the generally known demand of the market. The change in manufacturing policy should be delayed until the end of 1986 when Harnai Mills should be in a better position and properly organized, machinery would be in a better condition and personnel would have more training.

iii) The location and the method of operation of the Marketing, Sales and After-sales Function will influence its success in being able to assist Harnai Mills to utilize fully the Mills' potential output capacity. This function should be located away from Harnai Mills and near potential customers, both contract and private e.g. Lahore, Rawalpindi and Karachi. At all times there should be a close co-operation between that function, Production Office and Cloth Styling/Designing Office at Harnai Mills when the trainees in cloth styling/designing gain practical experience.

iv) International and home trends and fashion should be watched and magazines with world-wide publication should be read in an endeavour to make products which have not been produced before or have special appeal to a potential customer.

New product development is dealt with in Part XXI. "Product mix. Development of new yarns and fabrics. Utilization of the old stocks of raw materials and yarns".

v) Any samples of cloths or blankets submitted to the existing and potential customers should be checked by a competent person such as the Cloth Designer.

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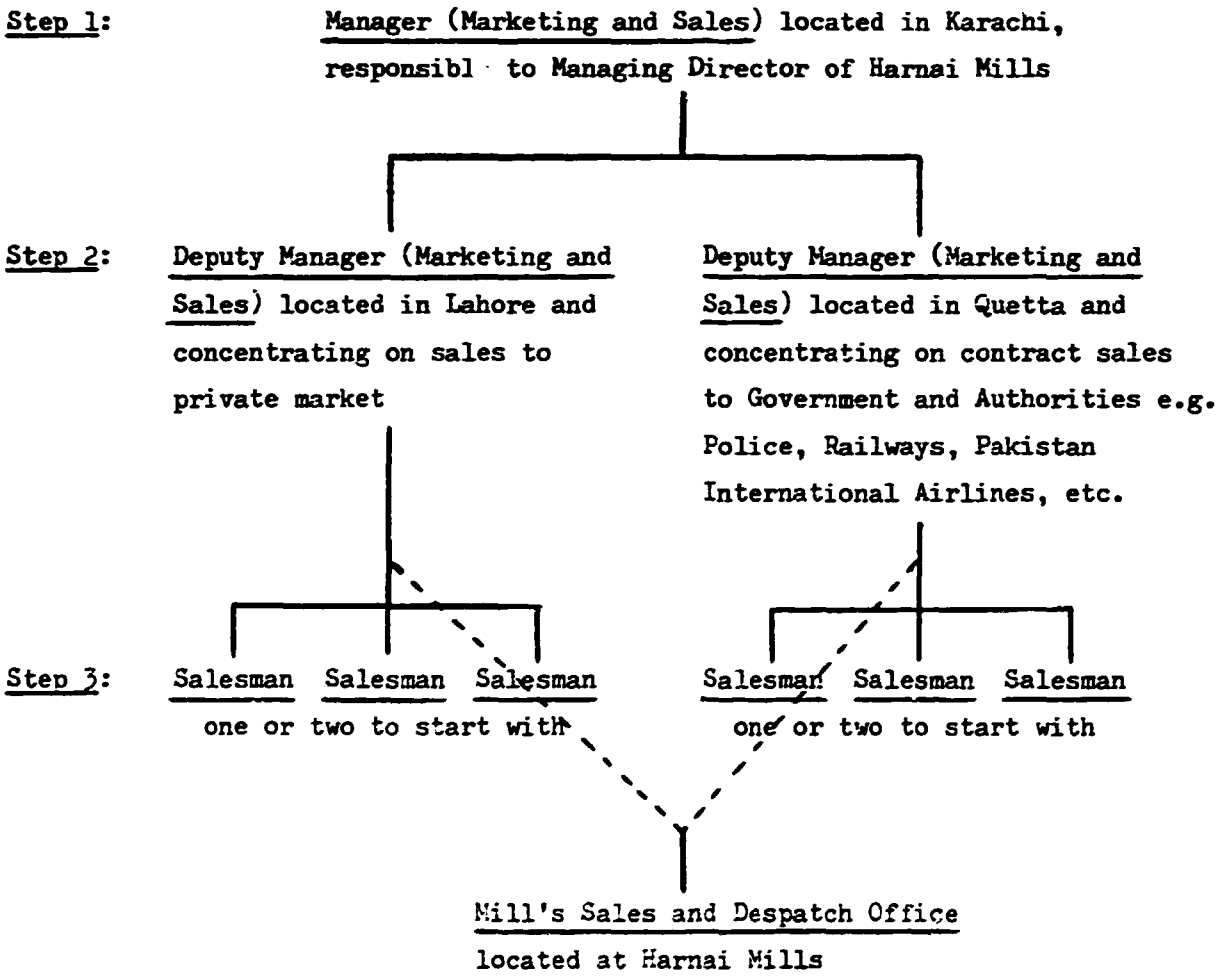
vi) A Marketing, Sales and After-sales Manager should be appointed to head this function - his appointment should be delayed until the end of 1986 to permit Harnai Mills to upgrade their performance and products but steps should be taken now to search for a suitable man.

A man with practical experience in marketing and sales - not necessarily an MBA but most important with good connections in the trade and some practical knowledge of cloth manufacturing - should be appointed to head this function.

The recommended structure and method of operation are given below. Further information is given in Appendix 59.



N.B. It is recommended that the appointment of the Manager (Marketing and Sales) be made first - Step 1 - so that he can participate personally with the Managing Director, Harnai Mills and PIDC in the selection of the team which will work under him.

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XXII. MARKETING, SALES AND AFTER-SALES FUNCTION

vii) An alternative arrangement to Entry (vi) would be to appoint Agents to market and sell on commission Harnai Mills' fabrics and blankets on the basis of being exclusive Agents for certain goods. But basing it on the writer's limited knowledge of the Pakistani market - and Harnai Mills' unfortunate reputation caused by various reasons - it is felt that at this point in time such an arrangement would not be successful as Agents of high repute and with good connections would be reluctant to commit themselves to Harnai Mills.

viii) The writer understood that there was a large stock of finished worsted fabrics which were damaged or of sub-standard quality for various reasons - these goods have been lying in the warehouse for some time.

It is recommended that either the Managing Director of Harnai Mills sells the stock himself or 2 (two) salesmen are appointed to sell it without "flooding" the market by "off-loading" the goods at ridiculously low prices, and without excessive publicity that Harnai Mills need the cash badly. The writer understood that the Managing Director was planning to visit in the near future Lahore and Karachi for that purpose.

ix) In the event of PIDC's decision to dispense with the existing very old machines in the Woollen Section and to purchase more modern, more productive, second-hand, reconditioned machines and some ancillary equipment, PIDC should first carry out a marketing study to determine the market potential for the types and yearly quantities of finished products (and including future possible orders for G.S. blankets, "Rainbow" blankets and Khaki overcoating cloth) so that detailed specifications for the types and the numbers of the necessary machines and the additional equipment to balance production - and to allow for some spare capacity for future expansion - can be prepared.

N.B. In the event of the second mission the writer will be glad to co-operate with PIDC and the Managing Director, Harnai Mills, in drafting a text for an advertisement for the post of Manager (Marketing and Sales), if asked to do so.

XXIII. FINANCIAL SITUATION

1. Prevailing situation

Seven examples of the situation which was detrimental to the overall performance, the morale and the reputation of Harnai Mills are quoted below:

i) The writer met by chance, at Harnai Mills, on 10 March 1986 Mr. Niamatullah Abid, M.I.E.(Pak), Director, Performance Evaluation Cell, Office of Auditor General of Pakistan, Lahore, and Mr. Muhammad Yaqub of the same Cell. During the conversation that ensued the writer understood that recently Harnai Mills have been operating at an annual loss of Rs.20,000,000 to 22,000,000 (twenty millions to twenty two million rupees).

ii) The writer met by chance, at Harnai Mills, on 15 March 1986 Mr. Muhammad Altaf, Sales Manager, M.S. Ghouri & Co., Faisalabad, (raw material suppliers), visiting Harnai Mills, whose payment had been overdue for some considerable time.

iii) The writer understood that the wages of "daily paid workers" for period 1 to 15 March 1986 amounting to Rs. 79,225.85 (seventy nine thousand two hundred and twenty five rupees 85 paisas) due on 22 March 1986 were not paid as of 30 March 1986 - the writer understood there was no cash in the bank and money was expected to come within 2 (two) to 3 (three) days.

iv) Information asked for and received from the Internal Auditor, Harnai Mills. Reference: Appendix 75.

v) The writer understood that during his absence in Karachi there was a strike at the Mills from lunch-break of Shift "A" on 7 April until noon of 8 April 1986 because the wage earners wanted long-overdue payment of arrears comprising increments for past periods.

vi) The writer understood that a considerable sum of money was long-overdue from Pakistan Railways for "Rainbow" blankets delivered by Harnai Mills.

vii) The writer was told that

a) Harnai Mills get Rs.119 (one hundred and nineteen rupees) for 1 (one) G.S. blanket out of which amount Rs.2 (two rupees) are paid out as Excise Duty.

And the expenses on the monthly basis, excluding interest on borrowed capital, were about Rs.1,200,000 (one million two hundred thousand rupees).

Thus Rs.1,200,000 ÷ Rs.117 = 10,256 (ten thousand two hundred and fifty six) G.S. blankets should be produced to cover expenditure only.

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b) Assuming 7,000 (seven thousand) G.S. blankets were produced per month the loss per 1 (one) blanket would be about Rs.50 (fifty rupees). In December 1985 only about 5,000 (five thousand) blankets were produced which resulted in the loss of about Rs.70 (seventy rupees) per blanket not including interest or depreciation charges.

c) Recently the losses have been covered by the sales of the stock of worsted cloth - and woollen cloth? - produced prior to June 1985. The problem was what would happen when the stocks are exhausted.

2. Recommendations

The writer is a layman in the field of accounting and has no professional qualifications in accountancy or company finance.

However, the burden imposed on the financial performance of Harnai Mills by the necessity to service debts is very heavy and some reconstruction of debts is recommended for consideration to reduce the burden of interest charges as shown in "Annual Report 1984 Harnai Woollen Mills Ltd Pakistan Industrial Development Corporation" asked for and received towards the end of the mission from Mr. Z.I. Bokhari of PIDC. Reference: Appendix 76.

Furthermore - basing it on the writer's daily work and problems encountered at Harnai Mills - it is recommended that an immediate cash grant of about Rs. 550,000 (five hundred and fifty thousand rupees) is necessary. These funds should be used for strictly defined purposes only namely to build some buffer stock of raw materials, furnace oil, diesel oil, to purchase a minimum of the most essential spare parts such as pins for tentering machine, some fluorescent tubes, and to have some repairs of milling machines done by the specialist firms.

The writer understood that the recently-appointed Managing Director brought some funds with him during April 1986 and took the necessary action.

It is also recommended that further grants are given by PIDC namely

i) about Rs.1,000,000 (one million rupees) during Phase 1 of Stage 2 of the 3-Stage Plan for Harnai Mills,

ii) about Rs.2,000,000 (two million rupees) during Phase 2 of Stage 2 of the 3-Stage Plan for Harnai Mills.

The above 2 (two) grants should also be used for strictly defined purposes only namely to build buffer stocks of essentials including new type of blending oil and milling aid based on weekly or monthly consumption requirements, to purchase most urgently needed spare parts and to pay for the most essential repairs to machines and auxiliary installations, as well as services rendered by outside organisations or contractors e.g. connection to national grid to obtain supply of electricity.

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XXIII. FINANCIAL SITUATION

All the above mentioned 3 (three) grants totalling Rs.3,550,000 (three million five hundred and fifty thousand rupees) should be sufficient to enable Harnai Mills to increase considerably the quantity and quality of output and therefore pay for higher wages as the result of higher departmental outputs, and to pay for the increased overheads.

Further capital for the purchase of more modern, more productive, second-hand, reconditioned machinery to replace the existing very old machinery during Phase 1 and Phase 2 - and refurbishment of mill buildings and offices during Phase 3 - of Stage 3 of the 3-Stage Plan will be necessary if such a Plan is adopted for and by Harnai Mills. Projected investment requirements will be prepared after Phase 2 of Stage 2 of the Plan. But the writer has no professional qualifications to advise on the details of the financial strategy.

It was not in the writer's Terms of Reference received from UNIDO and not in the Remit received from Mr. Z.I. Bokhari to investigate costing and accounting areas. But basing it on the in-plant work at Harnai Mills and considering the then existing records in the plant it is suggested that from the semi-finished and finished product costing point of view the above mentioned two areas need to be looked at very searchingly.

Every department in the mill should be submitting the actual, exact and correct data in the context of the actual monthly consumption and output, and the projected attainable monthly output to facilitate the achievement of a break even point on manufacturing costs by Harnai Mills by 30 April 1987, possibly sooner.

XXIV. COMMUNICATION LINKS WITH THE REST OF THE COUNTRY, LONG-DISTANCE TRANSPORT FACILITIES AVAILABLE AT AND FROM HARNAI MILLS, AND CONTACT BETWEEN PIDC AND HARNAI MILLS

1. General remarks and prevailing situation

Again remote location is a factor which has an adverse influence on Harnai Mills' potential but this need not be so if communication links and transport are of adequate standards and are supported by a full mutual understanding between PIDC and the Mills.

The writer understands that there is a small telephone exchange at Harnai. But it may take some time to obtain a telephone connection with or from Karachi or Islamabad as the calls are put via Quetta and the line is such that on occasions it is difficult to hear a person at the other end. When the writer tried to telephone UNIDO offices in Islamabad on Saturday, 29 March 1986 it took just over 24 (twenty four) hours to get through and it was difficult to hear what the person was saying.

An express telegram sent from Harnai may take several days to reach Islamabad or Karachi as was experienced by the writer.

Travel by train to Karachi, Islamabad or other large cities is via Sibi. Train leaves Harnai at 15.15 hr and after changing at Sibi one arrives in Karachi about noon the next day or in Islamabad in the afternoon. The writer left Harnai by train on Monday, 31 March 1986 and after changing at Sibi arrived about 09.00 hr in Quetta the next day and then by air to Islamabad arriving just after mid-day. Air links from Quetta with other parts of Pakistan are good but the problem is getting to Quetta.

Getting by car from Harnai to Quetta may take, under best conditions, between 4 (four) to 6 (six) hours passing through the mountains and travelling on unmade roads for the great part of the journey and, as it is necessary to cross some river beds, there is always a hazard of an impassable road when it rains.

During the writer's recent mission there was at Harnai Mills a minibus marked "Ambulance" which was used for travel in and around Harnai. The Wagoneer car which was used for travel to Quetta was in a very bad condition, was poorly maintained, needed many spare parts and major overhauling. It broke down in Quetta on 16 April 1986 and had to be left for major repairs and the writer returned to Harnai on 17 April 1986 by a hired small pick-up truck. It could not be started on the morning of 4 February 1986 to travel from a hotel in Quetta to Quetta Airport.

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XXIV. COMMUNICATION LINKS WITH THE REST OF THE COUNTRY, LONG-DISTANCE TRANSPORT FACILITIES AVAILABLE AT AND FROM HARNAI MILLS, AND CONTACT BETWEEN PIDC AND HARNAI MILLS

2. Recommendations

Speedy and much more reliable communication between Harnai Mills and Karachi and between Harnai Mills and the buyers and suppliers in various commercial centres in Pakistan as well as improved own transport facilities are essential to enable the Mills to start to conduct business successfully. An additional personal contact between PIDC and Harnai Mills would be of mutual benefit.

It is therefore recommended that

i) PIDC should make urgent representations to the Telecommunications Authorities to improve services from and to Harnai by advancing the automation of the local exchange and providing direct access to the national dialling network,

ii) Harnai Mills should have a new 4-wheel drive vehicle (Wagoneer type) which will be dependable when it is necessary to travel to Quetta Airport or to bring urgent spare parts from Quetta or for the Managing Director to travel directly to Karachi, at short notice, for urgent consultations. It is recommended that the old Wagoneer is used for transport in and around Harnai and that both new and old vehicles are used for strictly defined and limited purposes, and log books are kept with records of any journey made, for what purpose, what repairs/servicing and when are done (also petrol used for costing purposes) to preserve good condition and long service life of both vehicles.

The writer understood that PIDC were taking some action regarding car transport facilities to be available at the Mills,

iii) In addition to the existing contact between PIDC and Harnai Mills a serious consideration should be given to an arrangement whereby a very senior member of PIDC's Staff with the technical knowledge of mill operations visits Harnai Mills regularly, at least once a year, for say 3 (three) or 4 (four) days and stays not only in the Mills' offices but also spends some time inside the mill, on the shop floor, together with the Managing Director of the Mills.

This - in the writer's personal opinion - would be of mutual benefit. It would not only help PIDC in assessing the situation and potentiality of Harnai Mills but would also prove to the supervisory and technical Staff, and to the operatives, that Karachi does care about Harnai, and would also encourage all the employees to make additional efforts.

May the writer be permitted to say that Mr. Z.I. Bokhari in the light of his deep involvement in the writer's recent mission should undertake this commitment.

XXV. FEASIBILITY STUDY TO DETERMINE THE MOST ADVANTAGEOUS WOOL-BUYING PROCEDURES

Prevailing situation and recommendations

The writer understood that all the raw materials - except own woollen condenser (slubbing) i.e. soft waste and own woollen thread (hard) waste - are bought from the wool merchants or from textile raw materials merchants in the commercial centres such as Multan, Faisalabad, Karachi.

It may be advantageous to Harnai Mills from the point of view of price as well as early and quick delivery to buy indigenous wools such as Gija (mountain wool) and Gija (lowland wool) directly from the sheep farmers and/or shepherds.

The writer will investigate very briefly during a possible second mission to Harnai Mills the possibility of buying indigenous wools directly from sheep farmers and/or shepherds in the surrounding areas instead of from wool merchants in the commercial centres.

In any eventuality, it is recommended that a feasibility study to determine the possibility of buying the indigenous wools directly from the sheep farmers and/or shepherds, the advantages and disadvantages of such a procedure, should be carried out as soon as possible, jointly by the Managing Director of Harnai Mills and PIDC.

XXVI. WORK STUDY

Prevailing situation and recommendations

Harnai Mills were not - and will not be for some time to come - in a situation which would warrant Work Study to be carried out throughout the mill.

But it is recommended that - after a possible purchase, erection, commissioning and running-in of the more modern, more productive, second-hand, reconditioned machinery as well as some new machinery and equipment and after the machinery fitters and the c tives are in-plant trained - a well qualified and experienced in the wool textile industry Work Study Engineer is engaged, preferably from Great Britain, on a limited-time contract basis (say from January to April 1993) to carry out Work Study in every department of the mill.

XXVII. LECTURE DELIVERED AT THE TEXTILE INDUSTRY RESEARCH & DEVELOPMENT CENTRE, KARACHI

The writer delivered on 24 April 1986 at TIRDC in Karachi a lecture entitled "Wool and wool-blended fabrics (woollen fabrics and worsted fabrics - woven fabrics) - an international point of view regarding some aspects of cloth styling and designing in the context of raw materials, yarn and cloth parameters, manufacturing techniques, mill management, marketing of fabrics, and fashion".

The lecture was delivered at the invitation of and was organised by TIRDC with the approval of PIDC, Karachi, and UNIDO, Islamabad.

The lecture was presided over by Mr. G. N. Khan, B.Sc.(Pb), A.B.I.T. (Bradford), A.T.I. (Manchester), Post Grad. Dip. (High Polymer Chemistry Bradford), (Chartered Textile Technologist), Textile Commissioner, Ministry of Industries, Government of Pakistan, Karachi, and was attended by Mr. Mohammad Idrees Ahmed, Deputy Director, Textile Commissioner's Organisation, Ministry of Industries, Government of Pakistan, Karachi, members of TIRDC's Staff, people from the Industry and Mr. Sultan Taher, Executive Editor, Pakistan Textile Journal, Karachi.

The writer wanted Mr. Malik Mir Zaman, who was a trainee in cloth styling/ designing at Harnai Mills, to attend that lecture but he was going to be prevented from coming to Karachi by the then Project Manager on the grounds of lack of cash for travel. Upon writer's intervention resulting in a telephone call from PIDC the newly-appointed Managing Director sent Mr. Mir Zaman to attend the lecture. Subsequently, it was possible to work further (in a hotel) with Mr. Mir Zaman, and Mr. Z. I. Bokhari, PIDC, participated in some discussions.

Prior to leaving Karachi on 28 April 1986 the writer donated the following 3 (three) books to TIRDC's Library:

i) "Practical Statistics for the Textile Industry : Part I"
by G. A. V. Leaf. 1984.

ii) "Evenness Testing in Yarn Production : Part I"
by R. Furter. 1982.

iii) "Evenness Testing in Yarn Production : Part II"
by R. Furter. 1982.

XXVIII. GENERAL ENVIRONMENT. WORKING ENVIRONMENT

Having visited Pakistan for the first time the writer is not able - and does not wish - to judge or comment on the matters of general and working environment. However, the writer considers as relevant to record briefly what he was told also what he observed himself because these matters have some influence on the overall performance of Harnai Mills as well as on future planning and should be - and have been - taken into consideration when assessing the prevailing situation at the Mills and when submitting recommendations.

The writer was told that

i) Some previous managements, supervision and the labour force were slow-working and in some cases there has been a lack of capability for hard work and lack of sense of responsibility.

ii) In isolated areas like Harnai the management tend to avoid taking action against individuals because they may consider themselves as being victimised and may report to higher authorities. In this context hailing from Provinces other than Baluchistan is a factor which has to be taken into consideration.

iii) The labour force, in the main, is a generation of shepherds used to living in the mountains and in the surrounding district. Consequently, their "industrial culture" has not yet been fully developed. The younger generation is more sophisticated and better educated but even so it will be some time before the operatives can claim to be sophisticated and proficient industrial workers.

iv) Life in Baluchistan is generally based on a tribal system. There is a number of tribes under respective heads, and any differences of opinions tend to be carried over into the mill.

v) Although good technical people could be persuaded to come from other Provinces to work at Harnai Mills there is some resistance from the local population against their taking up positions at the Mills.

vi) Due to some deficiencies in the general education some of the people are, on occasions, swayed by the individuals who aim to succeed in their specific motives or vested interests.

vii) In some cases there are no proper records of people's ages and therefore on occasions, people state their ages to be lower than their actual ages. This results in some old people still working in the mill in spite of the fact that they are entitled to and should retire.

viii) Wearing a head-dress, often a large turban, and a loose national dress is a custom based on tradition.

ix) The rate of absenteeism is comparatively high due to attendances on the occasions of births, marriages, deaths, religious feasts and tribal gatherings.

Continued...

XXVIII. GENERAL ENVIRONMENT. WORKING ENVIRONMENT

The writer recognised that after about two weeks of in-plant work the attitude of the majority of employees at all levels was very friendly - they stretched their hand to shake hands. One of the Departmental In-charges invited the writer to his daughter's wedding - the invitation was declined and explanation given that the acceptance would have resulted in long travel and an unauthorised absence of several days from Harnai Mills.

The writer noticed that people were very religious and practised their religion faithfully. Prayers were said at the prescribed times. The unavoidable breaks in the continuity of work have been taken into account by the writer when estimating and projecting overall efficiencies.

The isolated and remote location and the inherent logistic problems have been dealt with in other Parts of this report.

Notwithstanding any constraints it is the writer's considered opinion that the personnel as a whole and the readily-available supply of labour whatever its background and shortcomings are a great asset of the Mills and that the potentiality of Harnai Mills is there. It can and should be developed and encouraged under the professional and able top management.

XXIX. WRITER'S POSITION VIS-A-VIS SUPPLIERS OF ANY GOODS AND SERVICES TO HARNAI MILLS

In order to facilitate PIDC's and Harnai Mills' decisions necessary to speed up modernization and rehabilitation of Harnai Mills - and to facilitate his own work - the writer had obtained in the past, and when necessary intends to ask for in the future, quotations from testing equipment makers, suppliers of blending oil and milling aid, second-hand machinery and spare parts merchants as well as machinery makers.

In this context the writer wishes to state that he operates with complete professional impartiality, has no vested interests in any organisation, company or academic institution, and observes the rules of confidentiality in his relationships with the Clients (in this case UNIDO and indirectly PIDC) and the potential suppliers of goods and services.

In all cases of consultancy assignments the writer works strictly on the basis of fees payable by his Clients. Commissions are neither sought nor accepted from the recommended suppliers of goods and services to the Clients.

The choice of goods and/or services and the supplier are based solely on the writer's judgement of the present and future needs of Harnai Mills and on the suitability of goods and services to give maximum benefit to Harnai Mills in achieving the necessary levels of product quality and operating efficiency.

In this connection carbon copies or photostats of letters addressed to the following companies had been sent or given to Dr. K.S. Stephens, UNIDO, Islamabad, Mr. M. Minke, UNIDO, Vienna and Dr. F.A. Rabbani, PIDC, Karachi.

i) Letter dated 6 January 1986 to James H. Heal & Co. Ltd., Halifax, England.

ii) Letter dated 16 January 1986 to Macart Textiles (Machinery) Ltd., Bradford, England.

iii) Letter dated 16 January 1986 to G.W. Thornton & Sons Ltd., Cheadle, England.

XXX. 3-STAGE PLAN TO MODERNIZE AND REHABILITATE HARNAI MILLS

During a meeting on 13 January 1986 at PIDC House in Karachi the writer suggested and outlined very briefly to the Chairman, the Director Finance, and the Deputy General Manager (Operations), PIDC, a 3-Stage Plan for the modernization and rehabilitation of Harnai Mills.

Basing it on the in-plant work at Harnai Mills and discussions - on various occasions at PIDC, at Harnai Mills, and with UNIDO Islamabad and Vienna - the writer developed a plan incorporating requirements of financial assistance from PIDC which requirements were requested by the Director Finance following discussions at the beginning of March 1986. The guidelines and some statement concerning the necessary financial assistance, and the projections of attainable increase in output as the result of PIDC's financial help were needed for a high-level meeting in Karachi on 10 March 1986 to be attended by the then Project Manager.

"Draft of an outline of a plan for Harnai Woollen Mills Ltd., Harnai, to be submitted during meeting in Karachi on 10th March, 1986" dated Harnai, 8th March, 1986 was not handed in during that meeting by the Project Manager. Reference: Photostat of the document constitutes Appendix 77.

Since then the following more compehensive 3-Stage Plan has been developed by the writer who recommends that this Plan is adopted for and by Harnai Mills.

PIDC's and Harnai Mills Managing Director's joint and appropriate strategy of combining good and realistically-priced product, technological and managerial expertise and effective marketing should pay-off all along the line. Eventually, top Government officials should, justifiably, take pride in wearing Harnai cloth, Harnai Mills should reach the forefront of technological progress in Pakistan, and the Mills' marketing and selling should penetrate all sections of the market.

Stage 1 - 12 January to 27 April 1986 (period covering the first mission, PIDC/Harnai Mills)

Improvements and/or changes in production techniques and processing routines, to upgrade the quality of product and increase output, start of in-plant training, also improvements in the condition of machinery and buildings that were possible with the then existing human, physical and financial resources and specifically

- Assessment of the prevailing situation and the Interim Report dated Karachi 5 April 1986,
- Terminal Report with final assessment and recommendations (principal and detailed),

Continued...

XXX. 3-STAGE PLAN TO MODERNIZE AND REHABILITATE HARNAI MILLS

- Cash grant of about Rs.550.000 (five hundred and fifty thousand rupees) from PIDC for the purchase of essentials such as buffer stock of raw materials, furnace oil and diesel oil, minimum quantity of urgently needed spare parts, and for repairs of machinery that have to be done by outside companies and for any work by contractors.

Stage 2 - 28 April 1986 to 30 April 1988

Phase 1 - 28 April 1986 to the start (at the end of October 1986) of the writer's possible second mission

All improvements and/or changes that are possible in the production techniques and processing routines to upgrade quality of product, to increase output and reduce unit cost with the existing human, physical and financial resources in accordance with the recommendations submitted in the Interim Report dated Karachi, 5 April 1986 and in this Terminal Report on the first mission and particularly

- Introduction of a new line-and-staff structure. Much stricter on-the-floor supervision in every department,
- Repairs to - and better maintenance of - machinery, auxiliary installations and buildings. Fitting-in of all missing fluorescent tubes,
- Receipt of cash grant of about Rs.1,000,000 (one million rupees) from PIDC for the purchase of essentials, for repairs of machinery to be done outside and for payments to contractors,
- Purchase of a different type of blending oil and a milling aid,
- Purchase of the most urgently needed spare parts for machines and equipment,
- Reduction in the amount of waste made in every department by about 25% (twenty five percent) possibly more,
- Building-up of buffer stocks of essentials,
- Commissioning of the already-installed new boiler,
- Connection of the plant and the Mills' Colony houses to the national grid to obtain supply of electricity,
- Achievement of the projected and attainable increase in output from weaving as stated in Part III. "Recent and the projected attainable before 31 October 1986...", Point 3.2 "Summary" and Point 3.3 "Comparison of production..."

Phase 2 - End of October to beginning of December 1986 and beg. January to mid-Feb. 1987 - period of 2.5 man-months (period covering writer's possible second mission)

Some reorganisation of the plant and further improvements and/or changes in the production techniques and processing routines to upgrade the quality of

Continued...

XXX. 5-STAGE PLAN TO MODERNIZE AND REHABILITATE HARNAI MILLS

product, increase machinery general utilization and output, and to reduce unit cost. Further improvements in the condition of machinery and equipment, auxiliary installations and buildings with the human, physical and financial resources available in accordance with the proposals which may be developed during possible second mission and the recommendations submitted in this Terminal Report on the first mission, and particularly

- Receipt of cash grant of about Rs.2,000,000 (two million rupees) from PIDC for the purchase of essentials and repairs of machinery that have to be done outside, and/or work by contractors,
- PIDC's consideration of restructuring of Harnai Mills' debts,
- PIDC's decision regarding long-term top management for Harnai Mills, and taking of the appropriate steps,
- Establishment of an appropriate marketing, sales and after-sales function,
- Assessment of the Mills situation and performance from May to November 1986,
- Issue of a job description to each employee, at every level, below the rank of Managing Director,
- Continuation of in-plant training of trainees in cloth structure, styling and designing,
- In-plant training of 2 instructors of loom fitters/tuners and 2 (two) instructors of weavers by the specialist instructors from TIRDC, Karachi,
- Implementing of improved production techniques and processing routines throughout the plant, particularly in blending (use of different oil, etc.), weaving, dyeing and finishing (use of a milling aid, etc.),
- Checking of the existing yarn and cloth parameters. Start of a gradual widening of product mix and gradual development of new woollen yarns and fabrics,
- Establishment of a small library to provide technical and commercial information for the Staff,
- Utilization of old stocks of raw materials and yarns for the existing and new types of fabrics,
- Devising and implementing of planned maintenance schemes for machinery, auxiliary equipment and buildings, and maintenance schedules (preventive and running). Repositioning of light fittings throughout the mill,
- Devising and implementing of appropriate and much stricter production planning and control, testing and quality control and waste control systems,
- Devising and introducing an improved production flow pattern, storage and handling of materials, and general housekeeping throughout the plant,
- Preparation of personnel, machinery and [illegible] generally for the re-start of worsted yarn and worsted [illegible] production [illegible] February 1987 (tentative date and subject to the progress made by the Woollen Section),

Continued...

XXX. 3-STAGE PLAN TO MODERNIZE AND REHABILITATE HARNAI MILLS

- Repairs to, servicing and calibrating of the existing testing and quality control equipment. Extension and refurbishment of the testing and quality control laboratory,
- Purchase (between February and April 1987) by PIDC of additional modern, simple-to-operate testing and quality control equipment as recommended in Part XII. "Quality of semi-finished and finished...", Point 2.4 "Testing and quality control...","Recommendations", Item (iii),
- Terminal Report on the second mission containing an assessment of the existing situation and recommendations (principal and detailed) including
  - a set of recommendations for further improvement of all processes and premises, material flow, storage and handling, quality of product, machinery general utilization and output and the reduction of unit cost.
  - draft specifications for and the envisaged numbers of the necessary, more modern, more productive machines, equipment and accessories (second-hand, reconditioned) to replace the existing very old machinery and equipment, also for new, additional machinery and ancillary equipment needed,
  - projected investment requirements.

N.B. Modification of the contents of programme could be made if required by any party concerned.

Phase 3 - Mid-Feb. 1987 (end of writer's possible second mission) to 30 April 1988

Further improvements and/or changes in production techniques and processing routines to further upgrade quality of product, increase machinery utilization and output, and to reduce unit cost. Further improvements in the condition of machinery, auxiliary equipment and buildings with the human, physical and financial resources available in accordance with the recommendations of the Terminal Report on the possible second mission, and particularly

- Feasibility study to determine the advisability of b[illegible] indigenous wools directly from sheep farmers/shepherds instead of from wool merchants in the commercial centres,
- Further widening of product mix and development of worsted yarns and fabrics,
- Training abroad of 2 (two) members of Harnai Mills' Staff (in Great Britain, approximately October 1987 to July 1988),
- Achievement of break even point on manufacturing costs by 30 April 1987 possibly sooner,

Continued...

XXX. 3-STAGE PLAN TO MODERNIZE AND REHABILITATE HARNAI MILLS

- In-plant (at Harnai Mills) training of instructors of fitters and instructors of operatives in carding, winding, warping, finishing, and instructors of operatives in whipping (sewing) of blankets by specialist instructors from Karachi-based TIRDC,
- PIDC's decision whether or not to purchase more modern, more productive, second-hand, reconditioned machines to replace the existing very old machines in the Woollen Section. In the event, PIDC's marketing study to determine market potential for types and yearly quantities of product (and including future possible orders for G.S. blankets, "Rainbow" blankets and Khaki overcoating cloth) so that more detailed specifications for the types and numbers of the necessary machines and ancillary equipment to balance production - and to allow for some spare capacity for future expansion - can be prepared.

N.B. Modification of the contents of programme could be made if required by any party concerned.

Stage 3 - 1 May 1988 to 30 April 1993

Major capital expenditure, re-equipment and continuation of improvements in all areas

Phase 1 - 1 May 1988 to 30 April 1990

- Major capital expenditure on purchases of more modern, second-hand machinery also any necessary additional new machinery,
- Major reorganization of Harnai Mills,
  - possible relocation of some departments within the buildings,
  - some repositioning of the existing machines,
  - erection, commissioning and running-in of the newly-bought machinery.

N.B. Modification of the contents of programme could be made if required by any party concerned.

Phase 2 - 1 May 1990 to 30 April 1992

Continuation of improvements in all manufacturing processes and particularly

- Erection, commissioning and running-in of the newly-installed machinery,
- Re-examination of any existing heating, air conditioning, lighting, etc. and purchase of any additional necessary equipment to have fully-controlled atmospheric conditions (humidification, air conditioning, heating and ventilation, dust extraction) and good lighting throughout the mill, and particularly air conditioning and wall insulation in testing and quality control laboratory.

N.B. Modification of the contents of programme could be made if required by any party concerned.

Continued...

XXX. 3-STAGE PLAN TO MODERNIZE AND REHABILITATE HARNAI MILLS

Phase 3 - 1 May 1992 to 30 April 1993

Continuation of improvements in all manufacturing processes and particularly

- Refurbishment of all mill buildings and offices (in the mill and administration) and houses in the mill's Colony,
- Purchase of sophisticated testing and quality control equipment for tops and worsted yarns,
- Work Study conducted in every department (starting in wool scouring) by a well qualified and experienced in wool textile industry Work Study Engineer engaged on a limited-period contract basis,
- The re-equipped Woollen Section and the improved Worsted Section on-stream, system of fully-controlled atmospheric conditions operational, all mill buildings and offices refurbished and Harnai Mills working as a profitable operation by 30 April 1993, possibly much sooner.

N.B. Modification of the contents of programme could be made if required by any party concerned.

General recommendation

It is recommended that - when the modernization and rehabilitation of Harnai Mills show visible financial and physical improvements on the past situation and after the re-start of the production of worsted yarns and fabrics - consideration is given to amending the present name of the Company i.e. Harnai Woollen Mills Limited to

Harnai Woollen and Worsted Mills Limited,
Harnai, Baluchistan, Pakistan
(A Subsidiary Company of Pakistan Industrial Development Corporation)

or

Harnai Mills (Woollen and Worsted) Limited,
Harnai, Baluchistan, Pakistan
(A Subsidiary Company of Pakistan Industrial Development Corporation)

or

a similar name which would reflect an improved plant engaged in wider activities and making better quality products.

In the writer's thinking an amended name would

a) convey an immediate indication that Harnai Mills manufacture woollen yarns and fabrics and also worsted yarns and fabrics - each of them being of a better quality than heretofore,

Continued...

b) help to create a new image and reputation for Harnai Mills and thus facilitate marketing and selling of their fabrics and blankets, particularly if in the future the Mills widen their product mix by producing various types of blankets and up-market woollen fabrics and worsted fabrics,

c) convey an indication that PIDC is giving the full backing to the Harnai enterprise by stating "A Subsidiary Company of Pakistan Industrial Development Corporation".

XXXI. ASSISTANCE FROM THE UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

1. Prevailing situation at Harnai Mills

Advice and in-plant practical help in solving managerial, organisational, personnel, technical and training problems also some funds for 2 (two) scholarships for Harnai Mills' Staff - one scholarship for a course in Cloth Structure, Styling/Designing and Cloth Manufacture, and one scholarship for a course in Mill Engineering and Services - to study in Great Britain are needed from UNIDO in order to make modernization and rehabilitation of the plant to be of lasting benefit to Harnai Mills as a manufacturing enterprise.

The above judgement has been formed by the writer during and after his recent mission (January, March, April 1986) to Pakistan Industrial Development Corporation (Private) Limited and to Harnai Woollen Mills Limited.

2. Recommended assistance programme for Harnai Mills

In the light of the need of the project the writer endorses the proposal from Mr. B. Vunibobo, UNIDO Resident Representative, Pakistan, and from PIDC, Karachi, that a second mission to Harnai Mills should be carried out in approximately 6 (six) months time. Reference: Appendix 78.

Mr. B. Vunibobo had kindly decided to avail himself of the opportunity on 2 April 1986 to learn about and discuss the situation at Harnai Mills with Dr. K.S. Stephens, Senior Industrial Development Field Adviser, UNIDO, Islamabad and the writer.

The writer recommends that the duration of the recent mission (January, March, April 1986) to Harnai Mills and to PIDC is considered as Stage 1 of the herewith submitted 3-Stage Plan of the modernization and rehabilitation of Harnai Mills.

If a decision is taken that a second mission should be carried out, the absolute prerequisites - in the writer's opinion based on his work at Harnai Mills - for an effective mission and for maximizing benefits to Harnai Mills and to PIDC would be the following points (A) and (B).

Point A

A split mission of total duration of 2.5 (two and half) man-months and the writer proposes one of the following time schedules:

Time schedule (a)

1st part: 1 (one) man-month,
30 October to 2 December 1986 - 34 (thirty four) man-days,

2nd part: 1.5 (one and half) man-month,
2 January to 11 February 1987 - 41 (forty one) man-days,

Continued...

or preferably

Time schedule (b)

1st part: 1 (one) man-month

8 January to 10 February 1987 - 34 (thirty four) man-days,

2nd part: 1.5 (one and half) man-month

9 March to 22 April 1987 - 45 (forty five) man-days.

The advantages of such an arrangement are:

i) Approximately 6 (six) or 8 (eight) months will have passed since the end of the first mission during which time many recommendations submitted in the writer's Interim Report dated Karachi 5 April 1986 and in this report should have been implemented by Harnai Mills and/or by PIDC or at least a start should have been made. November 1986 or January 1987 visit will maintain the momentum of progress. All the parties concerned are fully aware of the situations prevailing during the first mission and the areas that needed further help. Therefore, after very short discussions with PIDC in Karachi, further implementation of the recommendations already submitted and any necessary, additional changes can be carried out immediately at Harnai Mills in co-operation with the Managing Director.

ii) At the end of the first part of the mission (prior to departure for Great Britain) the writer will leave specific recommendations and guidelines to be followed until his return to begin the second part of the mission. During the writer's absence Harnai Mills will gain further experience and confidence in working without a Consultant "looking over the shoulder all the time". And the Mills can complete any arrangements necessary for the start of the second part of the mission.

iii) PIDC will have the advantage of being fully informed at the end of the first part of the mission about the progress made by Harnai Mills and any needs that may arise during the first part of the mission.

iv) The writer will report the progress made to UNIDO, Islamabad, by telephone from Karachi at the end of the first part of the mission, and to UNIDO, Vienna, by telephone from Ilkley after arriving in Great Britain.

v) If required, provisional quotations for more modern, second-hand, reconditioned machines to replace the existing very old machines can be obtained by the writer during his stay in Great Britain (December 1986 or February-beginning of March 1987). Consequently, all the relevant, up to date information could be discussed during the second part of the mission and would form a basis for the projected investment requirements which would be included in the Terminal Report on the second mission.

Continued...

N.B. The writer submits that - in the context of the total cost of the whole mission - the benefits derived from and advantages gained by a split mission will far outweigh the expenses involved in additional travel i.e. Karachi-London-Ilkley-London-Karachi.

Point B

In the event of Mr. Ashraf Waraich not being a resident Managing Director of Harnai Mills, an official authorization from PIDC, Karachi, for the writer to insist that - after discussions with PIDC and with the supervisory and technical Staff of Harnai Mills - the necessary changes and/or improvements that are possible with the readily-available resources are implemented without delay by the supervisory and technical Staff.

3. Donations made during March 1986

Because of the situations that prevailed up to and during the first part of the last mission (reported to Dr. K.S. Stephens, UNIDO, Islamabad) immediate help was needed in the form of tools, electrical equipment, books, etc. in order to facilitate modernization and rehabilitation of Harnai Mills. The following items were brought by the writer from Great Britain and deposited in the Mills' General Stores during March 1986 as donations.

3.1 From UNIDO, Islamabad, (authorised by Dr. K.S. Stephens)

- Tools, electrical equipment, books and stationery. Reference: Appendix 79/1.
- Cost of photostats of the writer's personal technical notes.

Total cost in Great Britain: £372.59p* (Three hundred and seventy two pound sterling 59p).

3.2 From the writer

Electrical equipment, books, stationery, whitewash, electric bulbs, etc.
Reference: Appendices 79/2 and 79/3.
Total cost: in Great Britain £65.47p* plus purchases in Harnai Rs.82.- (Sixty five pound sterling 47p plus Eighty two rupees).

*Air freight London-Karachi paid by UNIDO,
*Air freight Karachi-Quetta paid by Harnai Mills.

Continued...

XXXI. ASSISTANCE FROM THE UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

4. Recommended two scholarships for Harnai Mills' Staff to study abroad

4.1 Prevailing situation

Although in UNIDO's "Activities", "Inputs" and "Budgets" 2 (two) scholarships for training abroad were envisaged these scholarships would not have been of any benefit to the recipients and/or to Harnai Mills because during the writer's recent mission there were no suitable persons for immediate training abroad in weaving/designing amongst Harnai Mills' Staff.

The following references are quoted from pages 6, 7 and 9:
"8. Training abroad of woven fabric weavers/designers. UK (4 weeks) Dec. 85"
"-2 fellowships to weaving centre, fees only (4 weeks each)"
"BL 31-00 Fellowships (4X), fee only. In US-dollar 6,000"
and "Government Input"
"-Airfares for 4 fellowship holders... (UK)"

United Nations Development Programme
Project of the Government of Pakistan
Project Document
Title: Assistance to PIDC Woollen Textile Mills
Number: DP/PAK/85/006/A/01/37
signed on 26 and 27 June 1985

Therefore with the UNIDO's Vienna and Islamabad and PIDC's Karachi knowledge the writer had started - during the recent mission - in-plant training in cloth styling and designing of 3 (three) persons. Their further in-plant training will be continued by the writer in the event of a possible second mission to Harnai Mills.

The matters of the cloth styling and designing situation at Harnai Mills, selection of candidates and in-plant training in cloth styling and designing are dealt with in:

a) Part XV. "Personnel", Point 3. "Recommendations concerning transfers, upgrading and/or rewarding", Items (i) and (ii).
b) Part XVI. "Line-and-staff structure. Job descriptions", Point 1. "General remarks and prevailing situation".
c) Part XIX. "Technical and commercial information at Harnai Mills", Point 2. "Action taken during the recent mission".
d) Part XX. "Cloth styling and designing function".

Continued...

XXXI. ASSISTANCE FROM THE UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

4.2 Recommendations concerning two scholarships

In the light of Harnai Mills' situation and needs stated in this report the writer submits for UNIDO's, PIDC's and Managing Director's, Harnai Mills consideration - and recommends - that 2 (two) men are sent for theoretical training abroad namely:

i) Mr. Malik Mir Zaman for training in cloth styling and designing at the Scottish College of Textiles, Galashiels, Scotland, Great Britain.

ii) Mr. Mohammad Shaees Khan for training in mill engineering and services at the Huddersfield Polytechnic, Huddersfield, West Yorkshire, Great Britain.

It is recommended that

a) As the Schools of Textiles at the University of Bradford are no longer in existence these candidates would be sent to the above mentioned centres as being the most suitable establishments of Further Education to provide specialist training that is required to meet Harnai Mills' needs,

b) In both cases training would comprise a full-time, day course (also if needed, concurrent one or two evening classes per week) and would extend over 1 (one) academic year i.e. approximately 9 (nine) months from about end September 1987 to about beginning July 1988.

During the recent mission it would not have been proper for the writer to discuss training abroad with the recommended candidates. It is therefore suggested that the Managing Director would determine their preparedness for training in Great Britain.

To facilitate consideration by all the Authorities concerned the writer had made some preliminary enquiries regarding admissions and fees.

i) Re: Mr. Mir Zaman. The writer spoke on the telephone on 8 July 1986 and understood from Mr. A.D. Purdie, Academic Registrar, Scottish College of Textiles that the College had, in the past, a student taking specifically desired subjects during one academic year only instead of a four-year Honours Degree course. Mr. Purdie envisaged that it would be possible to take cloth designing and structure of woven fabrics as main subjects with one or two hours per week of the following according to requirements: spinning, weaving, finishing, mill management, marketing to equip the candidate for the post of Cloth Designer. At the end of studies and subject to achievements attained the College might award some type of a Diploma or

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a Certificate. An early application by or on behalf of the candidate is advisable stating what he had studied and when, degrees/diplomas/ certificates gained, practical work experience, what subjects the candidate wants to take and other supporting information.

The estimated and approximate budget requirements for a nine-months course would be:

* - College fees for an overseas student	£3,500
* - College accommodation and own cooking £20 x 40 weeks	800
* - College accommodation with full board £30 per week	-
* - Accommodation in a flat and own cooking £15.50p per week	-
- Food, laundry, books, stationery, incidentals £25 x 40	£1,000
- Bus ticket London-Galashiels-London	£80
- Travel London Airport-Bus station-London Airport	£10
	£5,390

say £5,400 (five thousand four hundred pound sterling).

* quoted by the Academic Registrar.

ii) Re: Mr. Shaees Khan. The writer spoke on the telephone on 31 July 1986 to the Huddersfield Polytechnic about availability of a course comprising specifically desired subjects in the area of mill engineering and services. The Academic Staff is at present on summer vacations but the respondent thought that such a course could be arranged by the Polytechnic. Prior to a possible second mission the writer will obtain detailed information.

The matters of the maintenance of workshops and mill premises, and selection of personnel are dealt with in:

a) Part V. "Condition of workshops, auxiliary installations, weight scales, measuring devices, and their maintenance".

b) Part VI. "Condition of mill buildings, mill yard, houses in the Mills' Colony, Club House, Dispensary, Guest Houses, and their maintenance".

c) Part XV. "Personnel", Point 3. "Recommendations concerning transfers, upgrading and/or rewarding", Item (iii).

iii) General remarks, Government of Pakistan input and PIDC's financial contribution

In the event of the second mission the writer will re-assess Messrs. Mir Zaman's and Shaees Khan's performances since the first mission and during possible forthcoming mission and will confirm or withdraw recommendations

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concerning their candidatures for training in Great Britain. If desired, programmes for their training abroad will also be prepared.

It is recommended that in addition to the Government of Pakistan input in the form of airfares for 2 (two) candidates, PIDC should provide some financial contribution towards the total cost of training of the candidates in Great Britain.

XXXII. CONCLUSIONS

In the writer's judgement the choice for further action is between prompt financial help being given by PIDC, assistance being provided by UNIDO plus improvements that can and must be implemented by Harnai Mills themselves without any grants of cash and without any assistance from UNIDO
and
Harnai Mills continuing to operate - at a progressively increasing financial loss - in the manner existing up to the start of the writer's recent mission and leading to a possible eventual closing down or selling of Harnai Mills to a private owner.

In order to operate successfully Harnai Mills require - at this point in time - financial help in the form of specific cash grants, restructuring of debts and short/medium term top management from PIDC as well as advice, practical help and some funds for two scholarships for study abroad from UNIDO. Notwithstanding any help and assistance from outside, there are many things that Harnai Mills can and must do themselves without any "money from Karachi" and without any assistance from UNIDO.

The three fundamental recommendations are that

i) Harnai Mills should continue to operate as a state enterprise under the aegis of PIDC,

ii) An appropriate strategy of combining good quality and realistically priced product, technological and managerial prowess, and effective marketing should be jointly followed by PIDC and the Managing Director of Harnai Mills,

iii) Managing Director of Harnai Mills should adopt for the running of the Mills a policy of "carrot and stick" - for the time being "40% of carrot and 60% of stick" and gradually changing the policy until it reaches the proportion of "80% of carrot and 20% of stick" by 30 April 1988.

The whole issue is very complex. It is a formidable task to upgrade Harnai Mills. But there is no reason why Harnai Mills should not achieve a break even point on manufacturing costs within 9 (nine) to 12 (twelve) months from the end of April 1986, possibly sooner, in spite of adversities. The detailed costing based on the actual, exact and correct data being supplied by each department of the mill is essential.

The prerequisite for modernization and rehabilitation of Harnai Mills is an effective and concerted action by Harnai Mills and PIDC in continuing the implementation of the recommendations listed in "Summary of principal recommendations". The sooner and the more of the recommendations are

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XXXII. CONCLUSIONS

implemented the sooner a break even point on manufacturing costs will be reached by Harnai Mills.

A Job Description containing well defined responsibilities, and where appropriate, authorities should be issued to each employee, at every level, below the rank of Managing Director. Compliance with the Job Descriptions will result in a much stricter on-the-floor supervision throughout the mill, improved maintenance of machinery and buildings, better quality of yarn and fabric, and higher output with the existing and future resources.

Under the circumstances prevailing during the writer's recent, on-site mission covering a period from 12 January to 27 April 1986 it was not possible to make many significant improvements during 40 in-the-mill working days at Harnai Mills.

To quote only a few examples

- it was not possible to improve the quality of yarn and the finish of fabric when a better type of blending oil as well as proper spindle bands were not available, milling machines were damaged, and blanket cloth was being dried on the roof of the mill buildings;
- it was not possible to increase greatly departmental outputs when carding machines, spinning frames and looms were standing idle, on some occasions, due to lack of buffer stocks and late delivery of a component to make a blend;
- it was not possible to increase the efficiency of the whole mill to a very marked degree when condition of machinery and buildings was poor, machines needed spare parts, delays in payment of due wages or arrears occurred because of lack of cash and the majority of the supervisory and technical Staff was not interested or not able to implement changes;
- it was not possible to develop new and fine quality worsted yarns and fabrics when the then produced, coarse type, heavy woollen fabrics were - in some instances - of sub-standard quality for various reasons.

Notwithstanding the circumstances, during the course of the mission as many as possible changes and improvements had been made by Harnai Mills. Assessment had been made, problems had been discussed with persons concerned and recommendations for further necessary changes in production techniques, in processing routines - and in many other areas - were submitted in the writer's Interim Report dated Karachi, 5 April 1986. Situations have been described more fully and specific recommendations enlarged and substantiated within the contents of this Terminal Report and the Appendices.

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XXXII. CONCLUSIONS

It can be seen from the following figures that the new trend as from March and April 1986 was very encouraging. Comparison of outputs from weaving expressed in terms of percentages of monthly increases in the total number of picks inserted in cloth during the weaving process - this being one of the criteria of any mill performance - proves Harnai Mills' potentiality which should be encouraged and fully utilized.

January 1986 : 100% - Actual (and taken as a basis for calculations),
February 1986: 105.11% - Actual,
March 1986 : 130.06% - Actual,
April 1986 : 185% - Extrapolated (from the actual figures up to and including 14 April 1986).

In conclusion. Comments may be voiced that this report is too pragmatic or that during the course of the mission more attention should have been given to matters of production techniques, processing routines, utilization of machinery, quality and quantity of product, and training. In the case of Harnai Mills it was necessary to find answers to - or at least to start action leading to solving of - fundamental managerial, organisational, personnel and financial problems before being able to start to submit and then implement recommendations to solve technological, production, quality and training problems.

In all cases of any recommendations the only criteria used were the writer's personal evaluations of the existing situations vis-à-vis the needs of Harnai Mills. Any recommendations concerning managerial, organisational, personnel, financial, production, technical and training matters have been based on practical experience in the Industry, Commerce, International Consulting and in Education, irrespective of particular persons holding specific posts. All recommendations are submitted for the Managing Director's, for PIDC's and for UNIDO's consideration.

With sadness mention had been made of specific posts or departments where unacceptable matters were of importance. Omission of such matters would not have produced a representative report.

It is the writer's duty - as an independent Consultant - to be objective and an obligation to UNIDO, to PIDC, to Harnai Mills and to himself to report the facts and circumstances as they were, and to submit appropriate recommendations.

Frank opinions - often very harsh - have been expressed in this report, stark data presented and radical recommendations submitted not for the purpose of solely criticizing but to enable Harnai Mills and PIDC to consider and decide

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on - and implement - the recommended and necessary changes also to allocate some funds for the present needs thus permitting the Mills to reach a break even point on manufacturing costs by 30 April 1987, possibly sooner.

With further own efforts, help from PIDC in the form of investment funds for the re-equipment of the Woollen Section - and practical assistance from UNIDO - Harnai Mills should then continue on a course leading to a full recovery thus becoming eventually a profitable woollen and worsted operation for the benefit of their employees, the people of Harnai Town and the surrounding district as well as for the benefit of PIDC.

The writer hopes that the specially-prepared and copyright "General remarks" at the beginning of various Parts of this report will be of interest and help to Harnai Mills.

It was a pleasure to visit Pakistan, a privilege to have been taken into confidence by PIDC and to work for UNIDO, Vienna and Islamabad.