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IMPROVEMENT OF MAINTENANCE PROCEDURES AND PRODUCTION MANAGEMENT PRACTICES IN SELECTED TEXTILE FACTORIES IN THE SOUTH

DP/VIE/80/038

VIET NAM

Terminal report

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

Based on the work of T. M. Haworth,
chief technical adviser

United Nations Industrial Development Organization
Vienna

V.85-18481

Explanatory notes

References to dollars ($) are to United States dollars.

The monetary unit in Viet Nam is the dong (D). The current rates of exchange are:

$1 = 11.955 Vietnamese dong
(normal bank mid-rate 10 December 1984)

$1 = 14.270 Vietnamese dong
(United Nations rate, December 1984)

The following abbreviations have been used in the text or this report:

MOLI	Ministry of Light Industries
UNDP	United Nations Development Programme
UNIDO	United Nations Industrial Development Organization
UTE	Union of Textile Enterprises

Mention of the names of firms and commercial products does not imply endorsement by the United Nations Industrial Development Organization (UNIDO) and the United Nations Development Programme (UNDP).

ABSTRACT

The project document of the project "Improvement of maintenance procedures and production management practices in selected textile factories in the south" (DP/VIE/80/038), for which the United Nations Industrial Development Organization is acting as executing agency for the United Nations Development Programme (UNDP), was officially signed in August 1982 and the chief technical adviser (CTA) was fielded in March 1983.

The project is being carried out within the area of technical assistance for the Ministry of Light Industries through its operating organization, the Union of Textile Enterprises. The activities are based in the Viet Thang Textile Factory at Ho Chi Minh City, in the south of the country.

The purpose of the project is to set up a comprehensive preventive maintenance system at the Viet Thang Factory and, once operational, to use this system to train maintenance personnel from other factories in the south.

Its objective is to increase productivity at selected factories in the south of the country by reconditioning some items of machinery at the Thang Factory and improving maintenance procedures.

Reconditioning work has been completed and the preventive maintenance system designed, prepared, and put into operation at the Viet Thang Factory. The propagation of the system and procedures to other factories has been initiated and the Union of Textile Enterprises needs to organise this work on a sound basis and to supervise its implementation.

To consolidate the benefits of the project the Union should also ensure adequate regular supplies of spares and consumable stores; improve and develop on-the-job training schemes; and improve the capabilities of the industry by judicious investment in process technology and appropriate types of equipment.

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INTRODUCTION

Following the decision of the Government of Viet Nam to earmark funds in the 1982-1986 UNDP Country Programme for assistance to the textile industry sector - especially to help rehabilitate the factories in the south - a UNIDO preparatory assistance mission visited Viet Nam in November 1981. Just over three weeks were spent in fact-finding meetings at Hanoi and Ho Chi Minh City and visiting several factories in the south. Subsequently, in co-operation with the Government and the UNDP resident representative, the project "Improvement of maintenance procedures and production management practices in selected textile factories in the south" (DP/VIE/80/038) was formulated on the basis of the mission's findings.

The textile industry in Viet Nam is roughly equally divided between the northern and southern parts of the country and ranks first among the manufacturing industries in terms of employment. Especially in the south the industry suffers from an acute shortage of spare parts and trained manpower at all levels and the result has been a continuous deterioration of the equipment and, consequently, of output and product quality since 1975.

The industry in the south is characterised by several large factories with a wide range of makes and types of equipment. As a result of policies, circumstances, and poor housekeeping many areas of these factories have a generally untidy appearance with obsolete and run-down machinery, much of which is beyond repair, excess labour, and insufficiently trained management. The Government is painfully aware of the situation and of the fact that massive capital investment and training programmes are in the long term the only possible solution.

In the short term, however, much can be done to slow down further deterioration of the existing equipment and to ensure that new equipment is diligently maintained from the start. This is the contention upon which the project was based and its design highlighted the necessity to improve substantially the system and standards of machinery maintenance.

The achievement of the expected results involved the preparation, demonstration and establishment of the system of preventive maintenance. To enable such a task to be carried out the rehabilitation of selected items of machinery was a prerequisite and a budget of US dollars two million was allocated to cover the cost of equipment, the services of experts for investigations, supervision of machinery reconditioning, and the training of factory technical staff.

The project approach adopted by UNIDO was to concentrate the main thrust in one single factory so that it would have a clear focus and its objectives and outputs could be explicitly defined and their attainment measured. The project was expected to have a significant impact in the areas of preventive maintenance, production management and process control but its implementation would not solve all - not even most - of the problems of the industry in the south.

The implementation of the project has been arranged in consultation with the Ministry of Light Industries and the Union of Textile Enterprises.

The National Project Director from the start of project activities in March 1983 up to November 1984 was Mr. Nguyen Van Tue of the Ministry of Light Industries, and several meetings with him took place at both Hanoi and Ho Chi Minh City. He was assisted by Mr. Nguyen Huu Nghia of the Technical Department.

As from December 1984 a new National Project Director was appointed by the Ministry. He is the Deputy Director of the Planning Department, Mr. Nguyen Hieu, and an initial meeting with him took place on 10 December at Hanoi.

At Ho Chi Minh City the representative of the National Project Director for project affairs is Madame Duong Minh Anh Lan, Deputy General Director, Union of Textile Enterprises and many meetings with her have been held. She was frequently assisted by Mr. Ho Sy Linh of the Technical Department and Mr. Tran Van Nho, Deputy Director-Technical, Viet Thang Factory.

The Government selected Viet Thang Factory, a spinning, weaving, dyeing, and finishing plant with a separate subsidiary weaving unit, situated twenty kilometres from the centre of Ho Chi Minh City and stated to employ 4,800 persons, as a suitable base for project operations.

The main site consists of several large work areas mostly equipped in two distinct stages by Japanese machinery in the early 1960's and American machinery in the early 1970's. The poor condition of machinery, the heavy incidence of stopped machines, the severe shortage of spares, and the limited level of training among the workforce had all influenced the decision to select Viet Thang as the project base.

At the time of the visit by the formulation mission the designed capacities of the various production units of Viet Thang were stated to be:

Spinning	6,800 tonnes of yarn
Weaving and finishing	33 million metres of fabric

On the basis of slender information it was thought that fabric production from the Japanese Toyoda looms (Weaving I) was of the order of 3.9 million linear metres from 600 operating looms. The mission was shown many machines which were stopped and without material to process owing to the lack of spares. Table 1 indicates the main production sections and the numbers of machines in operation. For comparison purposes the position at two other times is given.

Table 1. Machinery at the project site

		Installed	In operation November 1984	In operation November 1984
Ring Frames				
Spinning I	Toyoda 1960	43	24	40
	Howa 1962	61	28	46
	Saco Lowell	12	-	-
Spinning II	Whitin	50	38	43
Looms				
Weaving I	Toyoda 44"	553	425	553
	Toyoda 52"	147	87	127
	Toyoda with dobbies	164	80	146
Weaving III	Draper X3 72"	300	150	220
	Cr. & Knowles 72"	100	-	-

The departments of Spinning I and Weaving I, where activities have been concentrated, manufacture the following products:

Yarn counts Ne 8.3s, 10s, 20s and 30s

Fabrics - all cotton (loomstate particulars)

Calico	94 cm	258 x 234	20s / 30s	131 g/sq. m.
4444	103 cm	188 x 180	20s / 10s	177 g/sq. m.
Safety	36 cm	198 x 150	20s/2 / 8.3s	
Gauze	94 cm	180 x 110	20s / 30s	

Note: Details of the number of ends and picks are given as threads per ten centimetres.

The first stage of the project was to arrange for an Engineering Survey to specify what spares and equipment would be required to carry out the machinery reconditioning envisaged in the project document. Under a contract with the Toyoda machinery company four Japanese experts examined the Viet Thang plant in November/December 1982 and reported their findings in February 1983. The Chief Technical Adviser assigned to the project arrived in Viet Nam in March 1983 for a period of two years.

On the basis of a fully detailed quotation specifying the equipment and personnel services to meet project requirements C. Itoh & Co. Ltd, Tokyo, were selected as the main contractor to undertake the project activities and provide technical back-up services. This they arranged in collaboration with Toyobo Engineering Co. Ltd, Osaka, acting as subcontractor, whose staff worked at the project site between February and November 1984. The fee for services was $US 484,038.

The budget detailed in November 1981 in the project document required an input from UNDP of $US two million and from the Government of Viet Nam dongs 2,028,000.

A project revision in November 1983 increased the UNDP contribution by $US 5,000 to cover the full costs of the study tour to Japan. In January 1984 there was a further increase of $US 10,000 to allow for the cost of training equipment. An increase of $US 16,551 was authorised in June 1984 to cover the expenses of a UNDP/UNIDO in-depth evaluation scheduled for September 1984.

Then in October 1984 there was a further increase of $US 100,000 to provide for supplementary spares found to be essential to complete the reconditioning work and for other equipment to improve maintenance and quality control facilities. The budget figure now stands at $US 2,131,551.

Meanwhile it had been estimated that the Government contribution should be raised to dongs five million to cover additional expenses in respect of local made spare parts for the machinery reconditioning and administration.

During the course of 1984 all equipment valued at approximately $US 1,185,082 for machinery reconditioning and training was delivered to the project site. This included replacements for damaged or incorrectly supplied items.

In general the equipment was of a good standard and had been well packed and supplied with fully detailed documentation. Its transfer from the harbour to the factory was carried out smoothly and without delay. The arrangements made by the factory staff for customs clearance and temporary storage of parts were excellent. The equipment has not yet been formally transferred to the Government.

The main purpose of the project has been accomplished in full as far as the establishment of the preventive maintenance system at Viet Thang is concerned. However in respect of Thang Loi and Dong Nam factories a revision of the work programme was made on account of the stoppage of some machinery owing to non-availability of spare parts and difficulties for the staff of the subcontractor brought about by the impossibility of obtaining descriptive manuals in English for the French spinning equipment, which was installed around 1979.

Although the training of management and maintenance staff suffered initially from a change in the subcontractor's technical team and a lack of prepared material it is believed that effective training was carried out during the activities at the three factories. This comprised on-the-job methods and formal lecture sessions and was directed towards the appreciation of production and quality control procedures and the development of maintenance skills and methods.

Viet Thang Factory is one of ten major units in and around Ho Chi Minh City under the control of the Union of Textile Enterprises. The total complement of machinery included in the group comprises 384,622 ring spindles and 4,463 looms plus some warp knitting equipment.

Of the total production capacity in the city the machinery installed at Viet Thang is equivalent to about 17% in spinning and 36% in weaving. It is understood that the total number of employees at the project site is now approximately 5,000 of whom 1,300 work in Spinning I and 1,200 in Weaving I. The number of personnel in these departments engaged in the maintenance of production, auxiliary, and electrical equipment is 170 and 160 respectively.

Taking into consideration the employees in all departments and sections it is understood that approximately 80% have been recruited since 1979.

The population of Viet Nam is expected to have grown to about sixty million by 1985. In December 1982 it was reported in the National Assembly that the estimate for home-produced textile fabric in 1985 was 380 million metres, i.e. approximately 6.3 metres per capita.

In 1983 the total production of fabric at Viet Thang was 20,750,000 linear metres in widths of 95, 100, and 155 cms. Thus by providing 0.35 linear metres per capita about five to six per cent of the country's supply of fabric is being produced at Viet Thang Factory.

Details of yarn and cloth production for the whole of Viet Nam are as follows:

	1980	1981	1982	1983	1984
Yarn (tonnes)	29,000	31,000	35,000	44,000	53,000
Cloth (metres)	260 mill	150 mill	250 mill	260 mill	320 mill

The following figures I to IV are layout drawings of the project site and the departments of Spinning I, Weaving I, and Finishing. Working areas are:

Spinning I	17,000 square metres
Spinning II	5,800 square metres
Weaving I	9,000 square metres
Weaving III	7,025 square metres

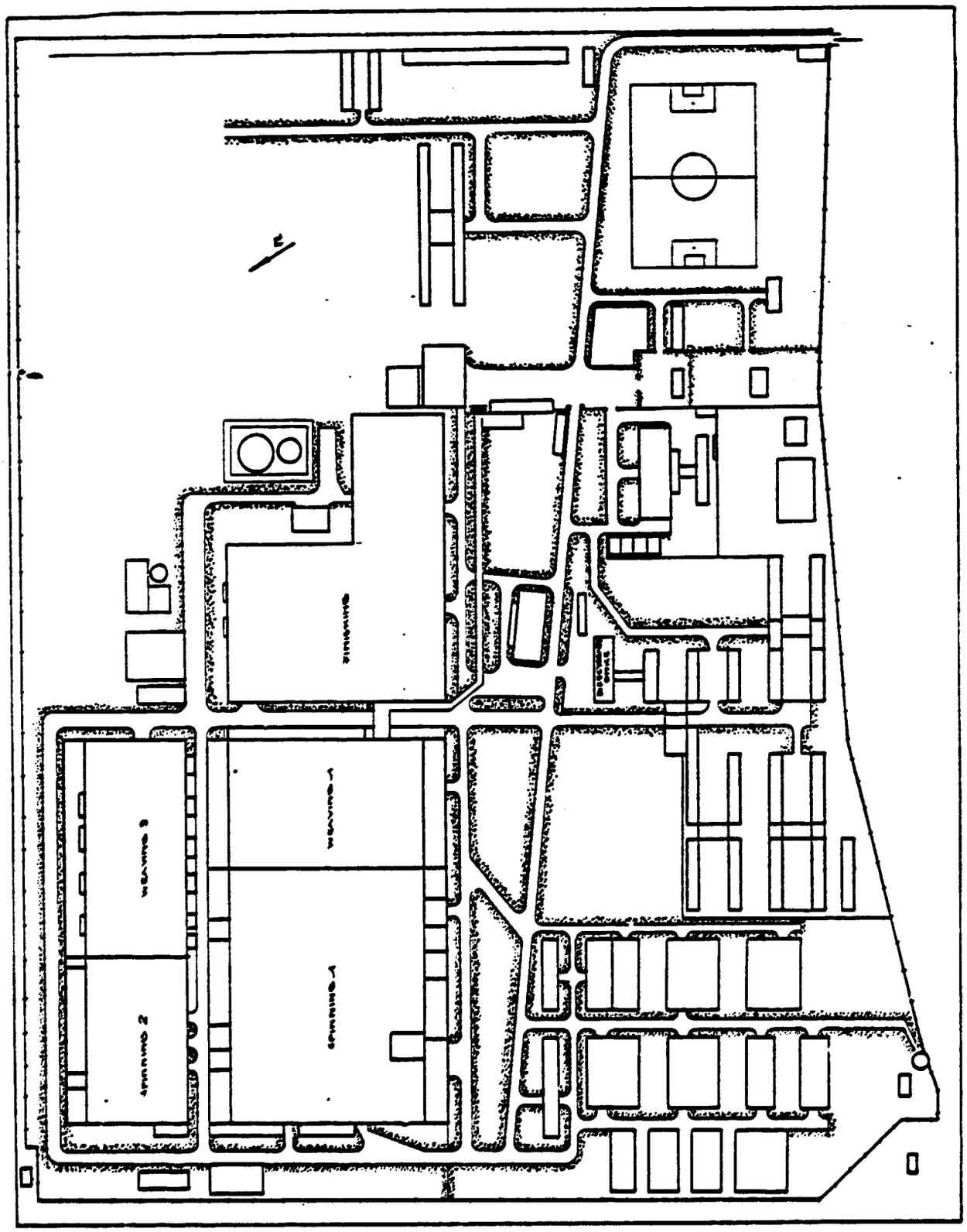


Figure I. Layout of Viet Thang Textile Mill

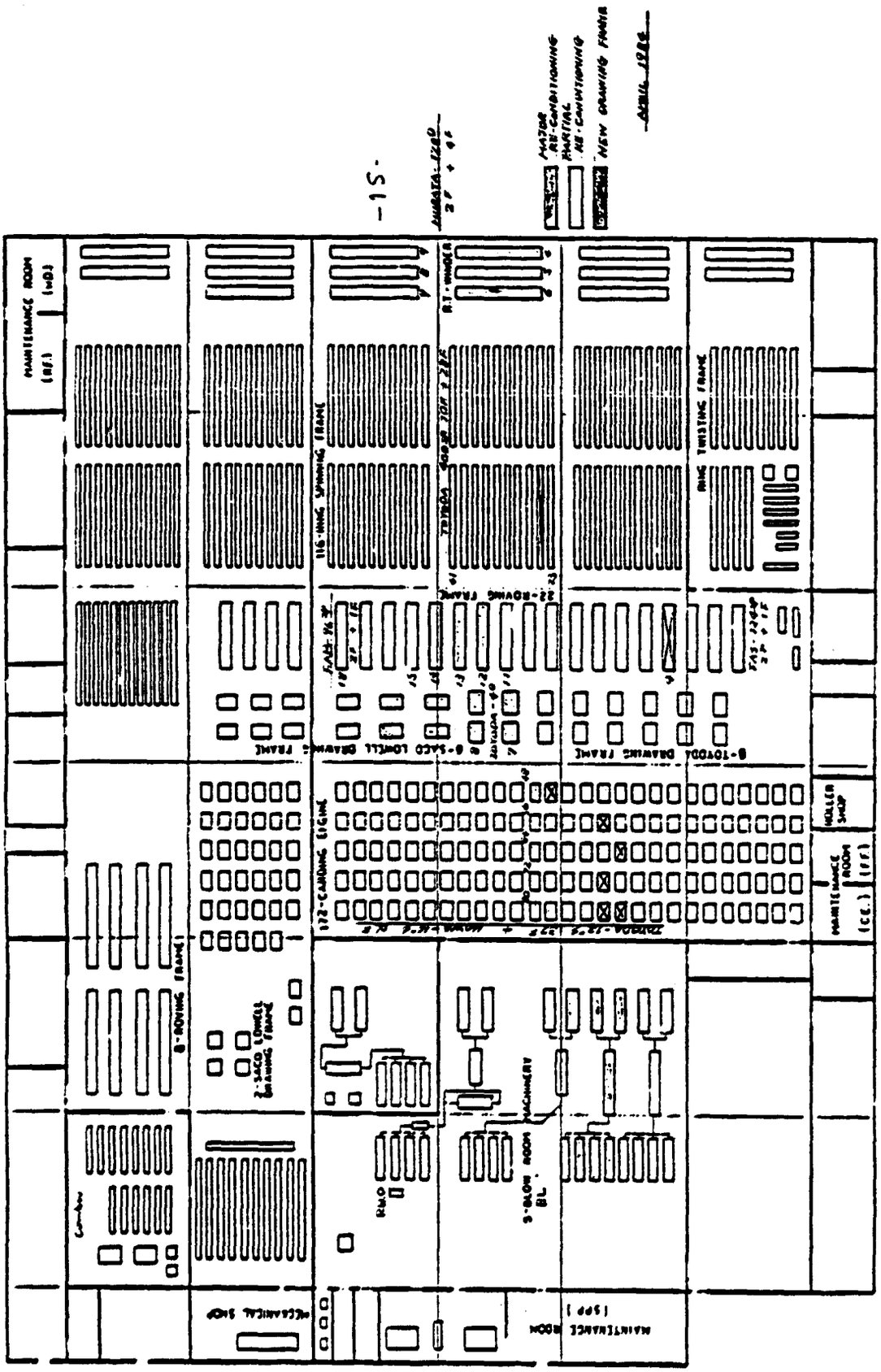
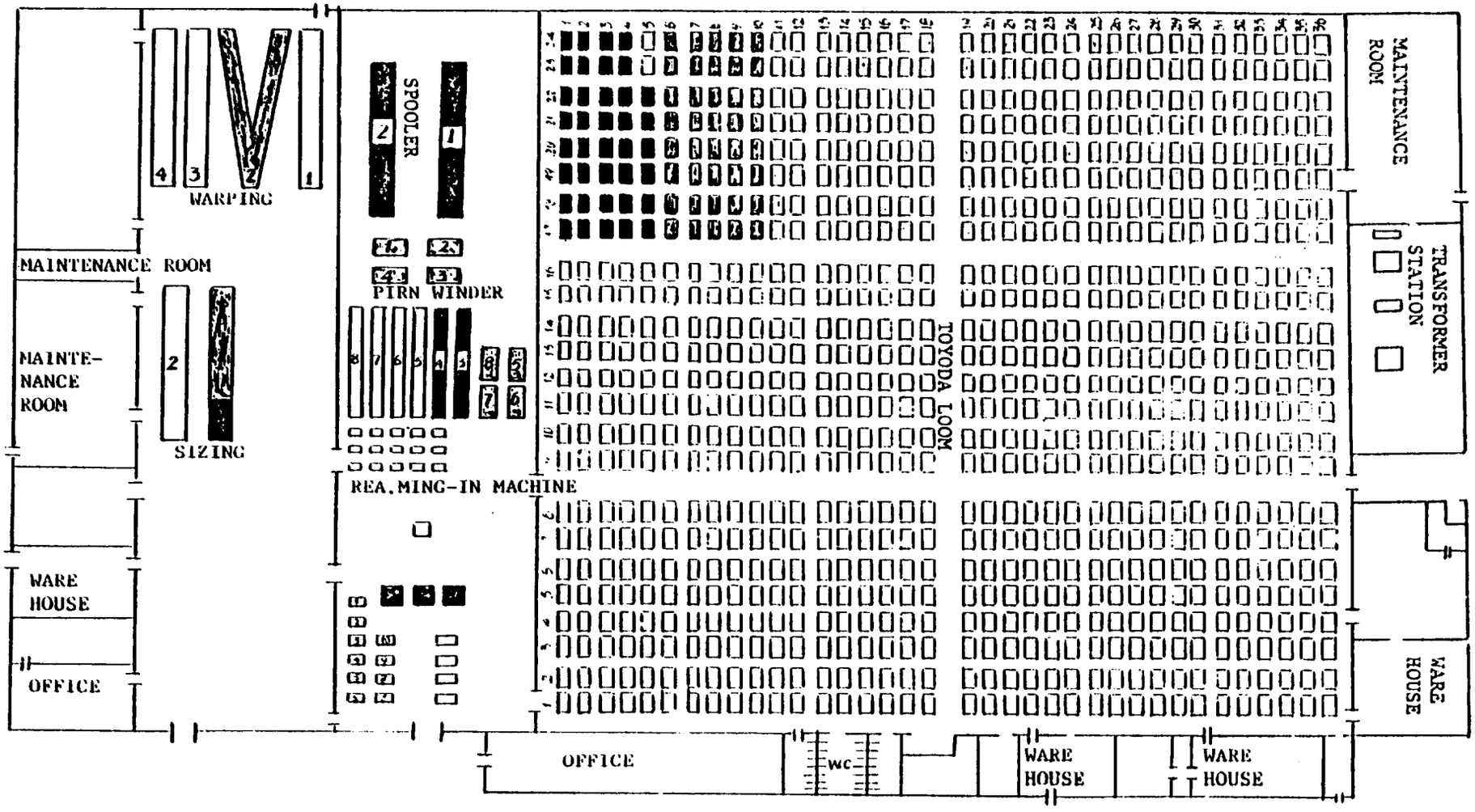


Figure II. Layout of Spinning Section I



Đại tu toàn bộ — Fully reconditioned
Đại tu từng Fần — Partially reconditioned
Lắp đặt mới — Newly installed
Chờ Khôi phục — To be reconditioned (V.T. internal plan)
Đang hoạt động — Running

Figure III. Layout of Weaving Section I

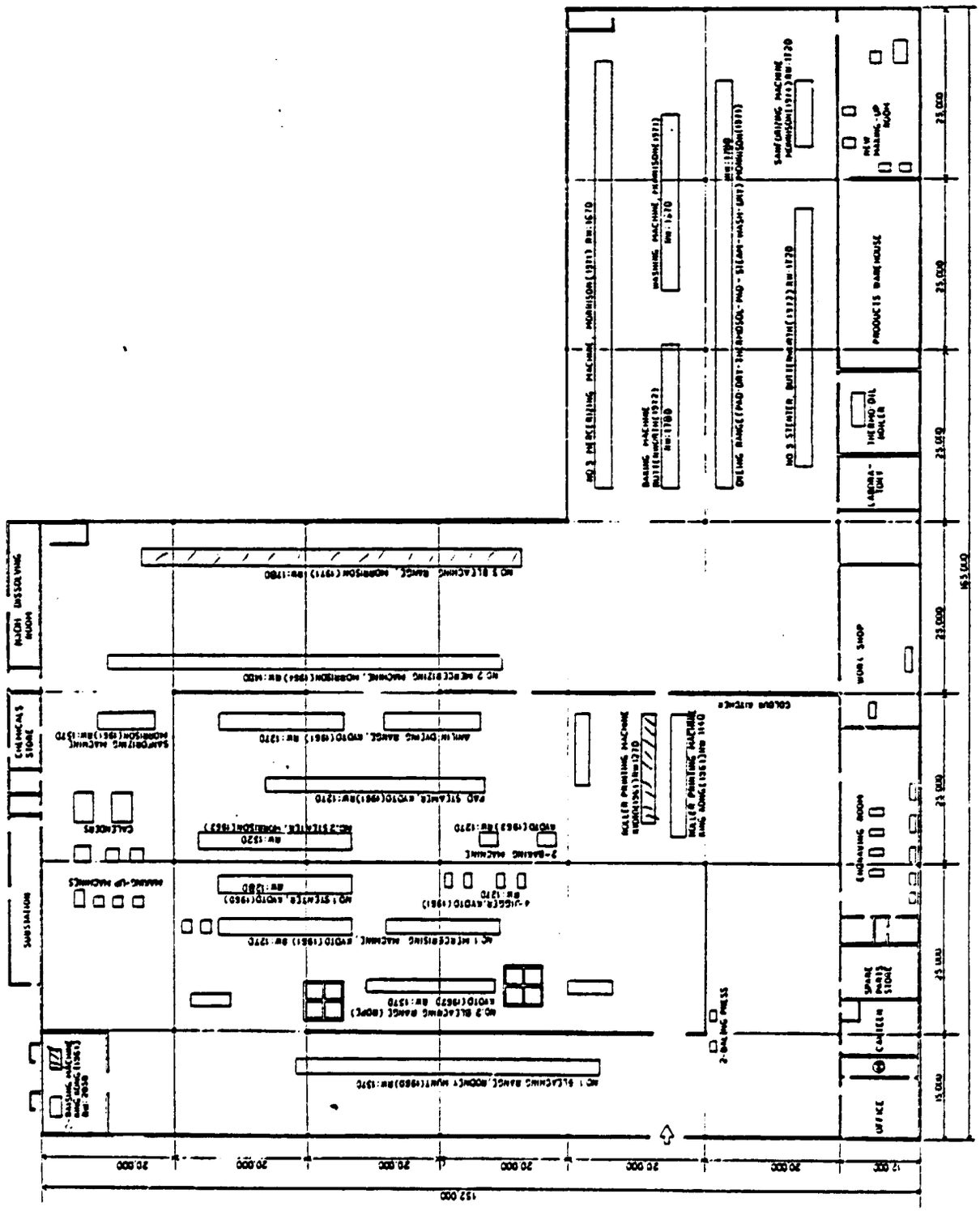


Figure IV. Layout of Finishing Department

RECOMMENDATIONS

1. To develop the benefits already achieved and to maintain the momentum of progress it will be necessary for U T E to organise and supervise the transfer of the preventive maintenance system to other factories in the area. This would involve the use of training material already made available during project activities and since collated and translated and passing on to other maintenance staff the appropriate skills, methods, and procedures.

2. Of the utmost importance to this activity would be the action taken by MOLI and UTE in effecting the organised procurement of spares and consumable stores to implement all aspects of maintenance activity. This would enable the timely restoration of inferior parts and mechanisms to be carried out and the schedules of planned lubrication to be strictly adhered to. Moreover to safeguard the effectiveness of such expenditure and activity all service installations would need to be kept in good order.

3. To facilitate the selection and procurement of spares and accessories further information concerning items and costs remains on record in the Toyoda Report of February 1983. The most effective utilization of this would result from the early implementation of those proposals considered to be appropriate to urgent requirements and economically sound.

4. The factory management at Viet Thang should remain alert to the necessity of monitoring the newly established preventive maintenance system. This would require an assurance that all maintenance staff including leaders and technicians were fully utilising the present levels of their knowledge and abilities by assessing the performance, in terms of quality and quantity, of the individual machine sections and the factory as a whole in comparison with accurately assessed and specified technical standards.

5. To support this assessment it will be necessary to determine if modifications to the established system are required in the light of results and experience after periods of three months and nine months. Later, medium term assessment will be required since the nature of preventive maintenence is to yield fully beneficial results in the longer term when applied to a full complement of machinery.

6. It is necessary for the factory management to devote more effort to the attainment of reasonable standards of quality in their products. This would involve consistent accuracy in machine settings, insistence on the use of correct work methods, careful and consistent cleaning procedures, and the continual analysis of process testing results.

7. The optimum intermediate and final product parameters and machine production rates should be clearly specified by the technical management of the factory and conformity should be maintained at all times.

8. Viet Thang Factory needs to prepare a production programme based on optimum machinery utilization and optimum rates of production. Thus a plan is required detailing the steps to be taken to determine how various improvements should be effected. This may mean, for example, an increase in the budget required by the factory to enable the cost-effective purchase of machinery parts from sources outside their own engineering facilities.

9. As an aid to controlling the utilization of materials and monitoring production and waste levels, it would be beneficial to arrange for periodical stock-taking throughout the factory. This would enable reconciliations to be calculated between individual machine sections, between departments, and between raw material and stores consumption and finished products.

10. All such matters should be blended into a coherent policy to upgrade the performance of the factories, both individually and as a group. Basing on such guidelines it would then be possible to create an effective factory organization, which would lead to the clarification of responsibility and the delegation of authority by drawing up suitable job descriptions for various members of management.

11. Improvements to the factory flooring and lighting were carried out prior to the start of machinery reconditioning. These should be extended and continued. Especially the lighting will make a notable contribution to better working conditions, a reduction in operative fatigue, and improved quality.

12. A concerted effort is needed to improve the design and availability of materials handling equipment for use in all sections of processing. It is particularly important to ensure fitness for the required purpose.

13. A systematic assessment should be made by technical staff to select critical items of spares and accessories where better quality would be beneficial and could be supplied by reputable engineering or other works in the south of the country rather than by Viet Thang's own facilities.

14. The managements of Thang Loi and Dong Nam factories should use the Viet Thang Preventive Maintenance System as a model and prepare their own details and records. They should then implement as many of the procedures as would be appropriate until the availability of sufficient quantities of spares and accessories would enable full implementation to be effected.

15. On-the-Job training schemes for operatives to promote the use of correct work methods need to be arranged at Viet Thang Factory to supplement the aim for improved quality products arising from improved machinery condition.

16. To increase production from the blowing section as a whole and to reduce the possibility of waste as each lap is fed at the cards the factory should standardise the length of lap produced at around 50 yards instead of the present 44/45 yards.

17. An improved method of preparing and feeding cotton to the blenders in the blowroom and the correct and careful use of a procedure for the adjustment during processing of the weight of lap per unit length at the scutcher should be established and monitored.

18. In order to increase output from the reconditioned blowing line an increased standard weight of lap per unit length and both scutchers operating at the higher of the existing production rates should be arranged.

19. The factory should adopt the correct procedure for the transfer of laps produced in the blowroom to the cards in order to minimise the effect of long term variations in processed material.

20. It would be advantageous to provide condensing trumpets at all cards to consolidate the sliver cross-section, to give better building and increased quantity in the cans, to reduce the number of piecings at the drawframe creel, and to enable better drafting to take place at the drawframe.

21. The practice by the drawframe operatives when creeling of using small batches of sliver transferred from one can to another and turning such batches over should not be allowed. This action reverses the position of fibre leading and trailing hooks during all subsequent drafting processes and gives rise to higher end breakage rates at the ring spinning frames.

22. Every effort should be made to avoid the use of small batches of sliver placed on upturned cans for feeding in the creels of some FAB roving frames. It creates unnecessary work for operatives, reduces the quality of the roving produced, reduces production at the roving and ring frames, and gives rise to higher end breakage rates at the ring frames.

23. Constant attention is required to ensure that all roving and ring tube packages are produced to the maximum size permissable by the physical characteristics of the machinery.

24. A plan of action needs to be made to concentrate on improving the broken end suction system at the ring spinning frames. The present condition of this equipment is seriously affecting attempts to improve quality, creates unnecessarily excessive waste, and it has a significant detrimental effect on production volume owing to the incidence of multiple yarn end breakages.

25. Obtain the necessary equipment to enable each doff of full ring tubes from every ring spinning frame to be weighed and maintain accurate records, which should be monitored for consistency over all frames spinning similar counts and with similar machine characteristics.

26. The present procedure of only partly filling loom warp beams with sized yarn should be discontinued. It creates unnecessary work, reduces fabric production, and increases production costs. Furthermore, the beam itself is small by today's standards and the method of use by the factory makes it equivalent to an even smaller one.

27. Urgent steps are needed to reinstate the mechanism to prevent starting places on all looms in Weaving I and the centre weftfork mechanism on all looms in Weaving III.

28. It would be beneficial for the purposes of process and production control to standardise the gearing on all machines producing material with the same processing parameters.

29. To assist in the control of waste a periodical waste test should be carried out in the spinning department starting with a fixed quantity of raw cotton and determining the quantities of waste and good material resulting at each section of processing. Also, there should be more accurate monitoring of the causes of processing waste and improved records of quantities arising at each machine section.

30. Correct processing at the Morrison bleaching range utilising the reconditioned steaming chamber should be instituted. This would involve the use of an enzyme treatment at the saturator prior to the steaming chamber and would result in better cloth preparation for the subsequent processes of scouring and bleaching.

31. It is believed that monitoring of the procedures and the accuracy of calculations made in the testing laboratory needs to be improved. This would include a thorough examination of the condition of all instruments and electronic calculators. Control of the levels of temperature and relative humidity is badly needed.

I. PROJECT DESIGN

A. Project Objective

To increase productivity at selected textile factories in the south of the country.

This will be derived from:

- the rehabilitation of existing machinery and equipment at Viet Thang Factory
- the improved standard of maintenance of old and new machinery at Viet Thang Factory and SACM spinning machinery at Dong Nam and Thang Loi Factories.

B. Project Logic

Development Objective

1. To increase the supply of home-produced textile fabric in the south of the country and to ensure a standard of quality that is acceptable to the people in general.
2. To rehabilitate the textile industry in the south.

In the short-term much can be done to slow down the rate of deterioration of existing machinery and equipment and to ensure that new plant is well-maintained from the start of its working life.

The problems to be addressed are:

- the continuous deterioration of machinery and equipment owing to an acute shortage of spare parts and trained manpower
- a corresponding reduction in quantity and quality of production.

Project Objective

The primary function of the project is to provide direct support to maintenance groups from several factories in order to rehabilitate machinery and establish the system of preventive maintenance.

By working at Viet Thang, a typical vertically integrated factory and in the new SACM-equipped spinning sections at Dong Nam and Thang Loi, the successful achievement of the project objective will forcefully demonstrate the value of preventive maintenance and create a nucleus of trained maintenence staff, which, if utilised beneficially, will progressively create a greater number of similarly trained technicians.

A satisfactory level of achievement will be demonstrated by:

- increased productivity from the machinery reconditioned during the project activities

- more machines in regular operation and material of an adequate quality standard from the reconditioned machines

- increased throughput capacity in the finishing department based on the factory's usual processing methods and working hours.

Outputs

1) Engineering Survey

- to assess machine condition and to prepare a detailed list of spare parts required to recondition the selected items of machinery.

2) Machinery Reconditioning

- to rehabilitate the old machinery and equipment selected for the setting up of the preventive maintenance system.

3) Preventive Maintenence System Established

a) for the selected production machinery at Viet Thang;

b) for the new SACM spinning machinery at Dong Nam and Thang Loi;

c) manuals compiled in English and Japanese setting out the work to be carried out on machines, assemblies, parts, and all related equipment; and the frequency of lubrication and cleaning;

d) forms in English and Japanese for reporting maintenance details and for the establishment of an information storage and retrieval system.

4) Maintenance Technicians (164 persons) from Viet Thang, Dong Nam, Thang Loi and four other factories with upgraded knowledge and skills concerning maintenance and processing technology.

5) Production Management Staff (15 - 20 persons) with capability to manage the maintenance system established:

- study tour

- advisory technical discussions

- seminars concerning production management practices.

II. ACTIVITIES AND OUTPUTS

A. Engineering Survey

Following the initial survey of five factories in Ho Chi Minh City the formulation mission was requested to look again at Viet Thang factory as the Government considered that it should be selected for improvement. In the remaining time available a further survey of the main machinery characteristics and condition was undertaken. It was considered that the most practical reconditioning work would involve Toyoda machinery manufactured in Japan.

Such information was used to draw up an indicative list of spares and equipment to form the basis for a notional allocation of budget funds.

Subsequently terms of reference for an engineering survey were compiled, in which the scope was described and the complement of main production machines given together with some brief notes on machine condition as perceived during the visit of the formulation mission in November 1981. As a result of a request from UNIDO dated 16 September 1982 the Japanese company, Toyoda Automatic Loom Works Ltd, Aichi, offered four experts to prepare a comprehensive report on the condition of machinery, service installations, and equipment at Viet Thang, including fully detailed lists of spare parts, materials, and accessories, which would need to be ordered from suppliers.

The survey was carried out by the team of experts accepted by UNIDO during the period 26 November to 15 December 1982. The report dated February 1983 was received and considered during March. It was observed that a very detailed survey of machinery and service installations had been made and lists of spares and equipment had been submitted for approximately forty sections.

In accordance with the terms of reference for the survey deficiencies were categorized in the following way:

1) items which were completely or almost completely deficient and were seriously affecting mechanical performance or process quality (Category A)

2) items which were partially or less seriously deficient but could be replaced with advantage if funds permitted (Category B)

3) items which were likely to require replacing in one to three years' time (Category C).

It may be noted that although the immediate purpose of the survey was to find out what would be required to recondition the selected items of machinery in the most beneficial way within the budget limitations provision was made also for looking further

ahead. This would provide the Government side with relevant information to determine their additional short-term requirements and to make plans for the medium-term. Such plans would enable serious consideration to be given to the economics of buying further spares or new replacement machines.

The extent of the deterioration in the machinery at Viet Thang is clearly shown by the summarized quantified findings of the expert team. However, the justification for the purchase of all the items for which price estimates were provided is dependant on technical and economic factors and each case needs to be judged on its merits.

For example, one group of parts for the Toyoda looms in the department of Weaving I (total cost U S $ 418,841) would restore the weft replenishment mechanisms (shuttle change - type now obsolete) but the desirability of accomplishing this would be refuted by the excessive initial cost, the excessive rate of shuttle consumption, the maintenance effort required to keep the mechanisms in order, and the small gain (if any) in loom efficiency.

In table 2 below the term "Priority 1" represents some of the machinery selected in the first place for reconditioning work under the project. Some machines covered by the survey were of American manufacture and this made the provision of all details difficult.

Table 2. Summary of reconditioning costs

		U S Dollars		
Dept.	Group	Category A	Category B	Category C
Spinning	Priority 1	645,802	652,367	193,253
	Priority 2	150,370	406,081*	757
	Priority 3	*	*	*
Weaving	Priority 1	267,155	278,830	175,848
	Priority 2	412,626	244,776*	66,994
	Priority 3	175,646	174,289	23,649
Finishing	Priority 1	200,000	93,025	83,379
	Priority 2	144,762	10,516	17,875
	Priority 3	100,740	1,178	480
Maintenance	Tools	102,659	25,829	244,323
Utilities		58,165	34,886	17,450
Total		2,257,925	1,921,777	824,008

* denotes item specifications/prices under investigation

The addition of the three Category A Priority 1 groups from spinning, weaving, and finishing plus tools and utilities amounted to U S $ 1,273,781. However, if the sections that were eventually to be included in the purchase order for spares and equipment are considered, it will be seen that a total of US $ 1,444,944 is reached. Thus to bring the total cost of spares, accessories, and equipment to within the UNDP budget limit required a major re-thinking of the process of selection.

After receiving the Toyoda proposal the Viet Thang Factory staff involved themselves in consideration of the spares lists. Furthermore the Union of Textile Enterprises desired to make an arbitrary allocation of funds reserved for the purchase of supplies and to utilise as many local parts as could be manufactured or made available. These factors became apparent during the course of discussions attended by representatives of UNIDO and the Japanese side in May 1983.

The main difficulty appeared to arise from somewhat different interpretations of project objectives. The choice of spares intended by UNIDO and C. Itoh was based on the need to rehabilitate selected production units in order to prepare for the establishment of the preventive maintenence system. However, U.T.E. and the Viet Thang management were also concerned with meeting their annual production targets and claimed that certain spares were available locally and should be deleted to avoid unnecessary duplication.

In the meantime, a supplementary proposal dated March 1983 had been received covering the services to be provided in order to accomplish all the activities stipulated in the project document in respect of the supervision of reconditioning, the establishment of the preventive maintenance system, and the training of staff.

Such requirements were also discussed by all parties in Ho Chi Minh City but it was considered that the proposal document should be revised and re-submitted. This took place in June by which time the chief technical adviser was heavily involved in extensive and protracted discussions on the composition of the parts lists. Thus it was noted that the items which were remaining unchanged from the original lists totalled in value to about US $ 750,000 only. This represented about 800 items from the original 1,100.

Finally, after many more discussions, letters, and telexes a Memorandum of Understanding was signed at the end of July by the Ministry of Light Industries, C. Itoh and Co. Ltd, and the CTA. This acknowledged agreement on the composition of the spares lists and other details regarding the supervisors to be provided from Japan and some arrangements for the study tour of Japan expected to be undertaken by management and supervisory staff concerned with the maintenance of production machinery.

Subsequently, on 3 August 1983 information was received from UNIDO stating that C. Itoh and Co. Ltd, Tokyo, Japan had been selected to undertake the activities of the supervision of machinery reconditioning, training, the establishment of the preventive maintenance system, and the arrangements for a study tour of several textile factories in Japan.

Although a period for discussion, clarification, and consolidation of detail is likely at the start of any project it is suggested that this could have been shortened under the following circumstances:

1) the drawing up of sectional lists of parts by Toyoda, which could then have been given consideration by the factory staff prior to the pricing of parts and the compiling of spares lists for the main proposal;

2) the provision by the factory staff of a fully detailed list of spares and stored secondhand (but sound) machine parts and accessories available for inspection at the project site for the work of reconditioning.

B. Reconditioning of Machinery

The sections of machinery in which reconditioning would take place had been elicited during discussions based on the broad indications given in the project document and the Toyoda report. In some cases single machines were involved whilst in others a number of machines were specified. The identification of such machines was largely confirmed in a memorandum circulated by the CTA in October 1983 although a few details were slightly changed in February 1984 after the arrival of the team leader appointed by C. Itoh.

Spinning I

1	Toyoda 1966 Blowing line
1	Roving waste opener
32	Toyoda Cards
2 sets	Toyoda Drawframes each two machines with four deliveries
3	Toyoda Roving frames Type FAS 124 spindles
3	Toyoda Roving frames Type FAB 96 spindles
38	Toyoda Ring frames 400 spindles
6	Murata Cone winders 120 drums

Spinning II

1	Barber Colman four count spooler Type C 216 winding positions

Weaving I

1	Barber Colman Warper
3	Kanamaru Warpers
2	West Point Sizing machines
8	Scharer Pirn winders each ten spindles
200	Toyoda 52 inch looms some with dobbies - manual weft replenishment

Finishing Department

1	Kycto Roller printing machine
1	Morrison Bleaching range
1	King Kong Raising machine

New Equipment to be installed

Spinning I	2 sets Toyoda Drawframes each two machines with two deliveries
Weaving I	1 Baba Sangyo Sizing headstock Model BS II Reed space 44 - 65 inches

Several units of specialised auxiliary equipment

Rehabilitation was expected to be carried out by 9 Japanese machine supervisors and over 100 Vietnamese technicians from several factories. It was planned that 305 individual machines and 5 extensive ranges consisting of processing units in sequence should be given careful attention.

To accomplish this task the following spares and equipment had been organised:

1,315	items of imported spares, new equipment, accessories, and materials
836	items of spares to be produced in the factory's casting and engineering workshops
72	items already in store and reserved for the project
	some other items imported independently by the Government side plus various machine parts kept in several places inside the factory.

In preparation for the commencement of reconditioning work several jobs needed to be carried out at the factory.

These included improvements to the roof, floors, and lighting; cleaning of production areas and maintenance workrooms; removal of unwanted accumulations of parts and equipment; provision of adequate storage space and issue procedures for the extra spares and equipment; provision of adequate auxiliary production accessories to support the enhancement of quality and increased material throughput; and provision of satisfactory materials handling aids. Furthermore, foundations were required for the new drawframes and sizing headstock in accordance with the drawings supplied by C. Itoh.

The supply of imported equipment was largely accomplished in two shipments. The first, consisting of 138 cases and weighing 56 tonnes, was transferred to the factory by 14 February 1984. Its value was US $ 657,389 or 55.9% of the complete order. The second, consisting of 26 cases and weighing 13.5 tonnes, was transferred to the factory by 15 April. Its value was US $ 515,892 or 43.9% of the complete order.

The production of spares by the factory accounted for 597 of the 836 items planned by the end of March and 711 by mid-June. Slight delays arose while waiting for parts from both imported and local sources. As regards the new foundations these were completed in both machine sections soon after the arrival of the two erection supervisors.

The factory concentrated their resources and efforts on improving flooring and lighting. These and other features of the preparatory work outlined above require further and frequent attention and should be carried out in order to improve the effectiveness of production operations and working conditions.

Prior to the start of reconditioning work several of the selected machines were out of operation and had been so for some considerable time. It was difficult for the factory to find all the missing parts in order to re-build the machines and thus the start of reconditioning work was rather slow in the roving, ring, and loom sections. The list of such machines is given below:

Blowing	2	Blending feeders
	1	Opener
Carding	6	Cards
Roving	1	Type FAS frame
Spinning	1	Ringframe
Winding	1.5	Cone winders
Weaving	40	Looms 52 inches width
Finishing		Bleaching range - steaming section.

The first three Japanese machine supervisors arrived on 22 March 1984 and the next two on 12 April. Immediately following their arrival they made an assessment of machine condition in several sections by inspecting a sample number and noting deficiencies. In general, this resulted in indications of very poor machine condition owing to faulty parts and poor settings.

The work to be carried out under the machine reconditioning programme was described in both the Toyoda Report of February 1983 and the C. Itoh Revised Proposal of June 1983. The main features accomplished are briefly referred to below:

Blowing

- all units in the line able to operate satisfactorily except one blending feeder, which is waiting for a motor to be provided by the factory
- all beaters rehabilitated
- regulating mechanisms working effectively
- automatic lap doffing mechanisms restored
- safety guards found and re-fitted

Carding

- all cards were dismantled, usually to the bare cylinder and doffer, renovated where necessary, and completely re-built including the fixing of safety guards

New metallic wire on taker-in	32 cards
New metallic wire on cylinder	31 cards
New metallic wire on doffer	23 cards
New flat tops	11 cards
New flat stripping comb fitted	32 cards
New doffing fly comb fitted	32 cards

Existing Drawframes

- restoration of Set No. 8 was at a major level
- main drive gearing renewed
- bottom fluted rollers renewed
- calender rollers and coiler mechanism renewed
- top and bottom clearers re-fixed and adjusted

New Drawframes
- 2 sets installed on new foundations
- performance test carried out (see Annex H)
- oil leaks from some gearboxes remedied

Roving
- FAS frame No. 4 re-built using new spindles, long collars, bobbin wheels, cone drums, and fluted rollers
- in general all function assemblies dismantled, checked, re-assembled, and adjusted including gearing, differential mechanism, draft gearing, builder mechanism, bobbin carriage slides, fluted rollers, spindles, and flyers
- new parts utilised where supplied

Ring Spinning
- Frame No. 25 re-built using gearing end parts
- in general ten frames fitted with new bearings for fluted rollers, new lappets and snail wires where appropriate, new heart-shaped cams and parts for builder mechanism, some new jockey pulleys and top drafting aprons
- ring spindle oil removal and re-filling unit put into use

Murata Winding
- re-built the whole of Frame No. 6 and half of Frame No. 4
- new tension devices, clearers, and stop motions fitted where appropriate
- sixty new winding drums, 120 new cradles complete with cone holders, and many new bearings fitted

Barber Colman Spooler
- renovated winding drums and 40 spindle pockets
- renewed 216 cheese cores and six elevator chains
- knotter, down take arm, down take segment, roll brake lifting plow, cheese restoring plow, trolley truck, and small end finder roll renewed on traveller

Warping
- renovated main clutch drive, brake cylinder, and drum brake
- creel checked and all necessary adjustments made

Sizing

Machine No. 1
- new Baba Sangyo control and winding headstock fitted in place of old West Point headstock
- performance test carried out (see Annex I)

Machine Nos. 1 and 2
- overhauling PIV gearboxes
- dismantling of drying cylinders and covering four with Teflon sheeting
- cleaning and re-greasing cylinder bearings
- dismantling of size box and repair of squeezing rollers and steam pipes
- repairing of immersion rollers, guide rolls, creel stands, and brackets for warper beams

Pirn Winding
- overhauling of winding units
- repair of driving shafts, threader heads, and stop motions
- restoring operation of pirn feeding and machine cleaning traveller and pirn hopper

Weaving

Re-assembling 40 looms mainly using parts produced in the factory's casting workshop and found scattered around the department and putting into operation
- alignment of main frame, shafts, and bearings
- installation of main drive and renewal of braking, shedding, and beating-up mechanism
- dismantling and re-building of warp let-off motion, warp stop motion in case of end breakage, cloth take-up motion, and slay including shuttle boxes

Partial overhauling of 160 operating looms
- angle and alignment of reed and shuttle box back
- firmness of reed and adjustment of shuttle protector
- correct operation of weft fork mechanism and take-up motion in case of weft breakage or running out
- inspection and adjustment of let-off motion, shuttle checking, and ring temples

Printing
- removal and replacement of main cylinder supplied by factory
- conversion from two to four colour printing by re-building pressure control system for four printing rollers
- restoring doctor blade traverse motion
- replacement of eight drying cylinders including steam and drain piping
- renewal of main belt drives

Bleaching
- restoring steaming chamber by replacement of defective rolls and bearings and window glasses
- improvement of washing tanks by replacement of defective rolls and bearings
- replacement of mangle bowls, expanders, and cloth guiders
- fixing thermometers for better process control
- overhauling electrical control system, pipes, and valves

Raising
- renewal of eighteen wire fillet raising rollers and defective bearings
- renewal of plain belts for wire fillet roller drive, strippers, and V belts

The total of machines/lines given attention under the completed reconditioning programme was 311 including the roving waste opener in the blowing section. This resulted from the inclusion of all 39 operating ringframes. Concerning the finishing department as one of the originally chosen supervisors became ill while still in Japan his assignment was taken over by two others.

The main features of the implementation of machinery reconditioning are summarised in the subsequent paragraphs.

1) Frequent meetings between the Union of Textile Enterprises, the Factory Deputy Director (Technical), Factory Departmental Staff, and the Chief Technical Adviser to arrange for the implementation of preparatory work prior to the arrival of the Toyobo Technical Staff.

2) Frequent meetings between the Factory Deputy Director (Technical), Factory Departmental Staff, the Toyobo Team Leader and Assistant Team Leader, and the Chief Technical Adviser to prepare and update work schedules in accordance with the normal and urgent requirements of reconditioning and specific requests from the factory to avoid interference to production.

3) Taking into account the full complement of the Toyobo technical staff group it was never possible to have a one-to-one pairing between one supervisor and one interpreter. In some cases, such as for the spinning, yarn preparation, and weaving supervisors, there was an initial shortage of interpreters, which impeded the start of their assignments. From the end of April, however, the situation improved and work could proceed more smoothly.

4) In carrying out the work of machinery reconditioning the machine supervisors gave instruction and guidance to the group leaders, sub leaders, and maintenance technicians in each machine section with the assistance of Vietnamese interpreters who could understand and speak Japanese. This was an important contribution to the effectiveness of project activities since, as well as supervising the work of maintenance staffs carrying out machine reconditioning, it was necessary also to arrange to give information and to demonstrate features of maintenance to implement On-the-Job training.

5) The purpose of such training was to develop a conscientious attitude towards maintenance work, improve skills, follow systematic methods and correct procedures, and, in general, to make good preparations for the establishment of the system of preventive maintenance.

6) It was noticed that the factory had a tendency to rely almost entirely on its own internal resources for the preparation of spares and accessories. Some items are not good enough for the required purpose e.g. ring frame drafting top roller brackets, ring frame draft gearing assemblies, and loom shuttle box parts which perform the function of checking the shuttle. Obtaining such items from reputable local engineering works should be investigated.

7) The activities of reconditioning and training were completed broadly in line with the estimate of four months given in the C. Itoh proposal of June 1983. It was feasible, therefore, to begin the implementation of the preparations for the preventive maintenance system during the month of August 1984.

As will be seen from table 3 below the total number of man-days of reconditioning work undertaken by the maintenance technicians was 13,339 or, assuming 25 working days per month, 534 man-months.

Table 3. Reconditioning programme

Section	Machines or Line	Start	Finish	Supervisor	Technician	Working Days
Blowing	1	24 May	31 Aug	1	8	85
Carding	32	23 Mar	10 Aug		14	120
Exist Drawframe	4	2 Jul	11 Aug	1	14	35
New Drawframe	4	11 May	6 Jun	1	7	22
Roving FAS	3	23 Mar	5 Jly		13	89
Roving FAB	3	17 May	21 Jun		14	30
Ringfm (major)	10	23 Mar	9 Jly	1	13	92
Ringfm (partial)	29	9 Jly	11 Aug		21	29
Murata Winding	6	11 Jun	31 Aug		7	70
BC Spooler	1	12 Jly	18 Aug	1	10	32
BC Warper	1	30 Apr	14 May		8	12
Kanamaru Warper	3	15 May	11 Jun		12	23
Baba Sizing	1	11 May	6 Jun	1	13	22
W P Sizing	1	16 Jly	31 Jly		11	13
Pirn Winding	8	1 Jun	11 Jly		13	34
Looms (major)	40	13 Apr	15 Aug	1	30	106
Looms (partial)	160	4 Jly	25 Aug		24	45
Printing	1	15 Jun	18 Jly	2	10	28
Bleaching	1	9 Jly	1 Aug	1	10	20
Raising	1	15 Jun	9 Jly		8	20

C. Establishment of the System of Preventive Maintenance

Preventive maintenance is a system based on industrial experience that utilises the skills of staff to check the condition of, and to carry out restorative work on, machinery parts and assemblies at pre-arranged intervals of time. It also stipulates the frequency in terms of days, weeks, or months when important accessories should be removed and replaced by new ones, when settings should be checked and adjusted, and when lubrication and all levels of cleaning should take place.

The purpose of such work is to prevent the onset of unsatisfactory running conditions and to forestall unacceptable wear, unforeseen failure of accessories, or frequent breakage of parts leading to irregular machine stoppages and the disorganisation of a maintenance programme.

It is necessary to analyse the cost of maintenance work and to compare this with an assessment of the value of the resulting benefits. If the performance of a particular item of machinery would be enhanced by attention within a preventive maintenance scheme then improved reliability, higher efficiency, a reduction in running costs, and the attainment of an optimum level of production costs would be the criteria on which this was decided.

The objectives of preventive maintenance are:

- to reduce productive time losses due to unexpected breakdowns;
- to keep machinery functioning correctly and in proper adjustment;
- to minimise in the long-term the costs of maintenance activity.

In effect, the work of preventive maintenance is related to preserving the production potential by means of ensuring optimum machine performance.

The effectiveness of this system depends to a large extent on the correct planning of work requirements, the availability of parts and accessories of satisfactory quality, the use of correct work methods when attending to machinery, adherence to a stipulated timetable, and the keeping of records which preserve details of the work carried out, the staff involved, and the incidence and pattern of occurrences.

In order to keep a balanced workload for maintenance staff it is essential for certain types of work of an extensive nature to be carried out at regular intervals of time throughout a year. This means, for example, that a service period of six months for a ring frame should not be applied to all machines simultaneously.

If 42 ring frames are installed, one group of maintenance tasks occurring every six months will involve 84 periods of specified work to be undertaken each year. This should be implemented on the basis of seven services per calendar month.

As well as preventing most of the occurrences of unexpected breakdowns, the establishment of preventive maintenance will enable machinery performance to be improved by the elimination of faulty or broken parts and by creating the opportunity for staff to ensure consistently accurate machine settings.

Furthermore, the analysis of all recorded details will enable those responsible for maintenance control to estimate future requirements of spares and accessories with gradually improving accuracy. This is an important feature when the availability of cash and foreign exchange is limited.

Another benefit to accrue from the keeping of fully detailed records is that the frequent repetition of a similar cause of failure is highlighted. This would enable remedial measures to be applied and would act as a warning guide if additional purchases of machinery were contemplated.

The main advantages may be summarized as:

1. Increased machine availability as a result of fewer breakdowns giving improved reliability, productivity, and efficiency.
2. Improved machine performance and the facility of consistently satisfactory settings resulting in improved product quality, reduction in seconds, and longer machine service life.
3. Fewer major repairs due to consequential damage allowing better utilization of the maintenance workforce, reduction in overtime work, and cost saving.
4. Better control of spare parts and accessories leading to a reduction in stores stock without any sacrifice of performance.
5. Attention focussed on common causes of failure resulting in a reduction in the frequency of breakdowns and an improvement in parts and machinery design and in selection evaluations.

In order to set up a preventive maintenance scheme satisfactorily it is necessary to give attention to a number of important features. The following list is taken from the UNIDO publication, "Introduction to Maintenance Planning in Manufacturing Establishments".

Many of the items have been included in the scheme and documents provided by Toyobo but it should be borne in mind that the plan developed for Viet Thang Factory takes into account significant factors. These are the desirability of simple but effective implementation and records; the limitations to machinery improvement determined by overall condition; and the prevailing concern to foster a conscientious attitude in staff by aiming for the careful development of working skills and sound methods.

1. Register

A complete inventory of the machines and equipment required to be maintained under the system.

2. Maintenance Schedules

Schedules for inspection, lubrication, and preventive maintenance of the items in the register. The schedules may also be extended to include planned overhaul.

3. Work Specifications

General instruction cards or documents that identify exactly the tasks to be undertaken by the technicians within the system.

4. Maintenance Control System

A trigger procedure that initiates the activities in the maintenance programme at predetermined periodicities as listed on the maintenance schedule.

5. Resource Schedule

A manpower allocation system to ensure availability of the resources to implement the maintenance requirements of the plant and the optimum use of labour.

6. Maintenance Records

A record of maintenance carried out and a reporting system to management.

7. Maintenance Support Organization

The organization of maintenance support in respect of technical information, spare parts, consumables, tools, etc.

8. Liaison with Production

An effective system of agreeing with production management when maintenance may be carried out but without prejudice to good maintenance practice.

9. Planned Overhaul

Provision for ensuring the planned overhaul of plant, either on a regular basis in accordance with the maintenance schedule or during a shutdown period.

The basis for the whole project was developed from the acute necessity to arrest the deteriorating condition of machinery in the factories in the south of the country. Partial alleviation of this situation was planned for Viet Thang Factory by the provision of modest quantities of critical spare parts and accessories. In order to improve vital technological functions and the provision of processing information some items of simple equipment were also selected, such as tools, auxiliary maintenance servicing units, and a few basis items of laboratory equipment to facilitate process control and performance monitoring.

The supplying of such equipment was also a vital part of the longer-term aim of the project to improve maintenance procedures. The intention was that machinery could be kept in better condition within the limitations of factory material resources by providing training for technicians and a systematic scheme of maintenance that could be used at first for the reconditioned machinery. It was expected that subsequently the system would be enlarged to encompass all factory machinery and equipment including service installations and be used as a model to propagate the requirements and benefits in other factories.

The stated intention of the project was to supply a fully workable preventive maintenance system to three factories, namely Viet Thang, Thang Loi, and Dong Nam. The machine sections to be included at Viet Thang were concentrated in the spinning and weaving departments housing Japanese machinery. At Thang Loi and Dong Nam the system was to be installed for the French spinning equipment that had been erected during 1978 and 1979.

During the visit of the formulation mission in November 1981 it was considered that the machinery in Thang Loi and Dong Nam was in good condition and any significant deterioration should be forestalled by instituting satisfactory maintenance procedures. However since that time vital pieces of equipment had failed and it appeared that no foreign exchange had been made available by the Government to acquire new spares.

Furthermore, difficulties had arise.. in obtaining maintenance manuals in English to give guidance to the Japanese staff on maintenance requirements for the types of French equipment in use.

In May 1984 it was decided, therefore, to revise the work programme for Thang Loi and Dong Nam factories and the technical staff of Toyobo were requested to draw up proposals to meet the new situation. It was then agreed to provide assistance by the three spinning supervisors for two weeks at each factory to contribute towards an improvement in maintenance skills and practices and a reduction in the incidence of incorrect settings, defective machine set-up, and unsound processing techniques.

This programme was carried out between 10 September and 6 October and resulted in attention to several machines selected to serve as examples for the whole complement. Demonstrations were given and technicians carried out the work involved, which largely consisted of dismantling, cleaning, and re-assembling various mechanisms; re-aligning such items as top and bottom rollers, spindles, bobbin carriage slides and bearings; and making new settings where appropriate. It appeared that such maintenance work had never been instituted since the time the machines were erected. Thus it is necessary for the managements of the two factories to continue along the lines demonstrated and develop correct maintenance procedures.

The work of providing a scheme of preventive maintenance for Viet Thang Factory was much more comprehensive and carried out with greater attention to detail. In January 1984 the CTA visited Japan to review arrangements for various requirements including the establishment of the preventive maintenance system. Unfortunately no examples of manuals, specifications, or forms were made available for examination although it was stated that the working of the system had been demonstrated to Vietnamese maintenance staff during the study tour in November/December 1983. The types of documents necessary for the system were discussed and it was clear there was full understanding of the necessity of providing a well developed and well documented scheme for effective implementation.

Following a meeting between C. Itoh, Toyobo, and the CTA in Ho Chi Minh City on 7 July it was decided to set the starting date for the establishment of the preventive maintenance system for 13 August and Madame Lan of the UTE was informed by a letter dated 10 July. Owing to variations in the dates of completing reconditioning work in the machine sections at Viet Thang it was not possible for the five machine supervisors to commence simultaneously the initial stage of the implementation of the system. Furthermore, completion of all required documentation had been delayed.

Thus the start of serious work on preventive maintenance was rather erratic on the part of both project and factory staff. However, meetings were held at various levels both in administrative and work areas and gradually implementation within the machine sections gained momentum and became more effective.

The system put into effect at Viet Thang Factory is based on long experience of textile production and an assessment of local conditions. It is intended that maintenance work carried out is mainly within the boundaries of preventive maintenance but it has not been overlooked that there will be some incidence of an unexpected breakdown owing to the unavoidable nature of local circumstances and the ever present probability of machine failure.

The scope of preventive maintenance covers periodical attention given regularly at fixed periods. This is combined with any remedial action that becomes apparent following operational and processed material quality checks.

Periodical maintenance consists of attention to parts, assemblies, and settings in accordance with the specified intervals and lubrication schedules consisting of oiling or greasing or a combination of both. Daily maintenance consists of brief but careful checking of various aspects of machine running to keep optimum operational standards (looking, listening, and feeling) and preventing the accumulation of fibre and/or dust, which would impede correct operation and also create a fire hazard.

The scheme that has been provided should be regarded as a firm basis, which the maintenance control staff of the factory have to refine or amend where necessary taking into account changes or developments affecting the stipulations included in work specifications. For example:

- if spares or accessories are unavailable
- if there is deterioration or improvement in the quality of local made spares
- non-availability of oils or greases
- if maintenance accessories deteriorate, such as abrasive grinding wheels.

Thus the operation of the system has to be frequently and carefully monitored by maintenance control staff for many months to determine whether all aspects are practical and giving the expected results. This implies that both in-process and quality monitoring will also require very close and frequent analysis. There will need to be effective co-ordination between the maintenance and testing functions to obtain relevant information, evaluate results, and assess the need for decision-taking.

The maintenance control organization should be headed by the Factory Deputy Director-Technical. He should be responsible for ensuring that all features of the system are functioning satisfactorily and that the optimum condition is being attained for all machinery and equipment. This means that co-ordination of mechanical and electrical maintenance work will have to meet the needs of the preventive maintenance system. Furthermore, the head of the organization will be expected to ensure that spares, consumable stores, and maintenance equipment will always be available as a prerequisite for the continuity of work.

The Deputy Head - Technical in each department will be directly responsible to the Deputy Director for the effective functioning of the departmental maintenance organization and will give closer attention to the condition of individual machines in each machine section. Also, he will monitor the deployment and work of the technicians to obtain optimum results. He will be assisted by a Group Leader controlling each individual group of technicians working in a machine section.

The work to be carried out by the maintenance technicians is set out in a series of work specifications. Details are given for each type of machine and the parts to be given attention at the specified intervals are identified and a description given of the nature of the work to be carried out. This applies for attention to both machine parts and other control equipment such as for electrical, steam, water, or compressed air functions. Lubrication schedules together with diagrams indicating the places to be oiled or greased are provided.

To supplement and facilitate machinery maintenance it is essential to keep all parts clean. Not only will this enable a machine to function better, it will also lead to less material breakages during processing. Continual attention to this activity is a prerequisite where there is any intention to provide products of acceptable quality to international standards. Fibre fly, dust, and dirt need to be removed not just transferred to an adjacent part or area and then be allowed to remain.

The main components which have been provided to organise maintenance work and to monitor its implementation and progress are:

Job Card
- to initiate action

Work Specification
- to stipulate nature and frequency of attention to be given

Tools and Equipment required
- according to group of tasks to be performed

Lubrication Schedule
- type of lubricant, places, and frequency

Lubrication Diagram
- indicating places according to lubricant type

Cleaning Programme
- either by specially assigned workers or operatives

Function Checking
- carried out every six months to provide an indication of overall machine condition

Small Defects Checking
- random but frequent checking to assess situation in respect of small features which may accumulate and become serious if neglected

Charts
- to specify programme of maintenance work over an appropriate period of time

Checksheets
- to record signature of technician and work carried out

Reports
- to inform control staff concerning status of work.

An example of the scheme for Ring Spinning Frames is given in Annex L.

D. Training for Maintenance Technicians

Within the framework of project activities it was considered that training could be given to maintenance technicians, which would assist them by upgrading their skills, by explaining the technical aspects of machine processing, and by demonstrating better methods of machinery maintenance. As a consequence it was expected that there would be an improvement in the standard of maintenance work carried out within the textile factories in the south. This was planned for 164 technicians from several factories with the main emphasis being given to the staff of Viet Thang, Thang Loi, and Dong Nam factories.

The purpose of the training was:

- to increase the awareness of maintenance staff to the skills, methods, and procedures needed to carry out maintenance work;
- to promote a clearer understanding of the different types of maintenance work;
- to enable the reasons for the disciplines and rules of systematic and preventive maintenance to be more clearly understood and accepted;
- to explain the benefits to be gained in terms of improved machine condition, product quality, increased production, optimum lowering of costs, and the overall reduction in maintenance work;
- to impart and develop the necessary skills and understanding of procedures;
- to stress the correct methods of working and the importance of improvements in safety aspects.

Training began after the arrival of the Toyobo Team Leader. He made his first visit to Viet Thang Factory on 24 March 1984 and after a period of familiarisation he started to give instruction on some aspects of machine condition to the spinning machinery section leaders. After 23 March when the three spinning supervisors began their assignments training was stepped up until the start of machinery reconditioning. Thereafter the activities embodied in the programme of On-the-Job training developed for all spinning technicians.

Following the arrival of the yarn preparation and weaving supervisors training in their machine sections started on 13 April. In general this form of training continued for the whole of the period in which machinery reconditioning was taking place at Viet Thang. Thus, in the spinning department it covered the period until 10 August, in yarn preparation until 18 August, and in weaving until 25 August.

Training was given in manual skills, the nature of preparatory and assembling work on machines, and how to carry out such tasks. This was supplemented by discussing aspects of machine functions and related maintenance procedures. In addition, training sessions took place in maintenance workrooms to ensure a full understanding of the technology of processing and the standard of maintenance required.

The main features covered may be summarised as:

1. An analysis of the processing function of the respective machine sections and their relationship.

2. How to inspect the various mechanisms of a production machine and set it up correctly.

3. An investigation of the major and minor faults to be encountered and the effect of bad machine condition on quality and production.

4. The selection of required tools and their correct use in carrying out maintenance work.

5. The use and care of maintenance equipment and maintenance workrooms.

6. The demonstration of correct work methods, sensible practices, and an appropriate order for carrying out a sequence of jobs.

7. Aspects of safety in relation to machinery, maintenance equipment, and the way of working.

8. The dismantling and re-assembling of machines, the carrying out of adjustments, and the making of correct settings for all parts.

9. Correct methods of oiling and greasing.

10. The requirements, methods, and benefits of cleaning.

11. The purpose of testing for process control and the analysis of results.

The number of persons trained in the course of the programme are indicated in table 4.

Table 4. Number of persons trained at Viet Thang

Factory	Mar	Apr	May	Jun	Jly	Aug
Viet Thang	15	52	66	73	82	82
Thang Loi	1	3	7	7	7	6
Dong Nam	-	1	4	5	3	2
Khanh Hoi	1	3	3	3	3	3
Phong Phu	-	1	6	7	7	6

The maximum number of participants was 104. In addition, during the programme at Thang Loi and Dong Nam Factories, 30 and 35 respectively received training.

Furthermore, although not specifically referred to in the project document, 14 technicians in the finishing department at Viet Thang benefitted from working with three Japanese supervisors during a period of six weeks while reconditioning work was taking place on the bleaching range, roller printing machine, and raising machine.

The activities of the training programme took place during morning and afternoon sessions with the supervisors assisting the technicians in all aspects of reconditioning work and developing their knowledge and skills. The basis of On-the-Job training was particularly appropriate for the project as many of the technicians already had experience at varying degrees of competence. Essentially they needed to have such attainment broadened, consolidated, and modified where necessary so that their abilities could be directed along sound lines. Since many technicians had been given basic knowledge during formal vocational school training it was necessary to ensure that it was developed in the most practical and interesting way.

After acquiring the appropriate level of knowledge and skill the next most important aspect of such training was to develop the proper outlook for carrying out maintenance work carefully and systematically at all times. This required a clear understanding of the concepts of accuracy and tolerance in all work involving the putting together of machine parts, correct arranging, and setting in accordance with processing requirements.

In addition, the reasons for clarifying why a job should be done in a particular way were clearly demonstrated by reconditioning machinery and revising all settings. The effect of this in terms of improved quality and optimum production rates is being confirmed by improved performance.

During the training period it was considered that the necessity to obtain a satisfactory rate of progress prevented all participants from receiving the same information and instruction. However, this was counterbalanced by talks given by the supervisor away from the machine area and the provision of written material showing machinery details and providing notes covering aspects of processing and maintenance work. Furthermore, it was recommended that technicians made their own notes for future reference and in cases of absence from course activities.

While carrying out their training activities the Japanese supervisors assessed the competence of the technicians and whether or not progress was being made. Moreover they paid particular attention to the necessity to consider candidates as possible instructors to pass on the benefits of training to other staff by courses to be organised by the factory in the future.

Recommendations on these findings will be made in the Final Report to be submitted to UNIDO by the Contractor.

E. Development of Production Management

The main intention of this area of project activity was to broaden the knowledge and experience of management personnel and enhance their understanding of the elements of planning and control, which significantly affect the outcome of maintenance and production operations.

The main features of this activity have been:

- attachment of the chief technical adviser to the project who took part in advisory discussions, meetings and seminars arranged to consider technical matters;
- the study tour of textile plants in Japan undertaken by 21 participants between 24 November and 22 December 1983;
- the training sessions given by the specially assigned supervisor from Toyobo from 29 June to 4 September 1984;
- the provision of training equipment;
- the supplying of technical literature from time to time including 19 substantial reference books handed over on 30 July 1984.

Attachment of Chief Technical Adviser

Most of the activities involved in organising and co-ordinating project inputs have taken place in Ho Chi Minh City by liaising with the Deputy Director - Technical of Viet Thang Factory. However, some meetings took place in Hanoi with the National Project Director from the Ministry of Light Industries and others took place with the Deputy General Director of the Union of Textile Enterprises who represented the National Project Director in Ho Chi Minh City.

Many discussions were held and frequent revisions of plans took place concerning the composition of the list of equipment for machinery reconditioning. Furthermore, preparatory work at the factory prior to the arrival of the team of supervisors from Toyobo required careful joint planning with frequent sessions for discussions and the monitoring of progress.

Following the arrival of the technical staff from Japan regular meetings were held, at first with the Team Leader and later with both the Team Leader and the Assistant Team Leader, to consider the planning and organising of work, the checking of progress, and developments in the areas of training and preventive maintenance. Weekly programmes for meetings were drawn up and circulated to facilitate adherence to the arranged timetables.

Features of maintenance work and production operations were the subjects for many meetings and seminars. Topics usually resulted in detailed discussions and further investigations. Feedback was not consistent owing to staff being involved with other matters and duties.

To outline the nature of these activities the undernoted items will serve as examples.

An investigation into the amount of waste produced during processing in spinning revealed that between 15 and 17% was applicable depending on yarn count and types of fibre in use. As much as half of this was due to the removal of the ends of laps in carding and this practice was criticised. More careful monitoring and the keeping of records of quantities returned to the blowing section were recommended. However, the re-seeting of cards to control other forms of waste was virtually impossible owing to a lack of gauges. This situation has now been remedied by the project and it is necessary to review the amounts of waste resulting from processing on the reconditioned machinery.

The benefits of a correctly specified procedure for adjusting the weight of cotton per yard in laps produced at the scutcher were discussed. Sound practice would minimise rejects on account of being outside the control limits set. Furthermore, the expected advantages resulting from automatic lap doffing at the scutcher were considered whereby variations in weight per yard at the ends of each lap were expected to be reduced.

A check was recommended on the method of preparation of cotton to be fed to the blending feeders in the blowing section. Also, a modification made to the air suction dust filtration system resulted in improved working conditions in the same section. Regular tests on the amount of waste produced by ten flats at the cards was another suggestion made.

A useful feature in endeavouring to control the quantity of waste from processing would be to standardise the length of lap produced by all scutchers in the blowroom at fifty instead of fortyfive yards. Together with a slightly increased standard weight per yard this would also increase production from the section.

Several other changes which would also increase production as well as improving quality were considered. These included increasing the diameter of the FAB roving package produced to the limit allowed by correctly aligned flyers and the dimensions of the ring frame creel. In addition it was stressed to discontinue the practice of winding the roving coming from the ring frame creel around the traverse guide bar, which causes accumulations of fibre resulting from abrasion. These pass forward into the rollers of the drafting assemblies causing breakages or slubs in the yarn.

As sources of improvements in ring frame production it was suggested to use lower turns per metre in the yarn and to run the frames with the higher spindle speed of 9,000 rpm. These took into account the appropriate quality of Russian cotton and the use of the yarn in simple fabrics.

Again in the spinning department quality improvements would follow the use of a condensing sliver trumpet for both Toyoda and Howa cards and the more frequent removal of accumulated fibre and waste from the drafting assemblies on drawframes, roving, and ring frames. Furthermore, this work would have the effect of reducing the possibility of breakages in the delivered material at all these processes and of decreasing the work of the operators.

Another improvement having multiple benefits involves the filling of loom beams with yarn to the maximum diameter of the beam flange at the sizing machine. This would reduce the workload of drawing-in operatives, downtime at the looms, and the workload of weaving ancillary workers, and increase fabric production.

In order to improve fabric quality it was stated that it was essential to reinstate the mechanisms on all looms in Weaving I to prevent starting places and to reinstate the centre weftfork mechanisms on all looms in Weaving III.

All these items have either been referred to in meetings or in memorandums. Implementation would result in significant improvements to quality and productivity.

Study Tour

Although it was originally intended that the study tour participants should leave Ho Chi Minh City in August 1983 it was not until November that all formalities were completed.

The group consisted of supervisory personnel concerned with the implementation of maintenance and production activities. Twelve were from Viet Thang, two each from Thang Loi and Dong Nam, and one responsible for plant and equipment from the Union of Textile Enterprises. In addition there was one tour administrator and three interpreters.

Prior to the group's departure the participants had met together to discuss problems and matters of interest that they wished to study. Also, a briefing was given by the CTA to outline important matters to be given attention. These included:

- the basis for selecting machinery and equipment to be covered by preventive maintenance
- how is the system planned, organised, implemented, and controlled
- organisation and arrangements for the storage of parts and accessories

- processing parameters and process testing
- arrangement of electrical installation.

The tour lasted four weeks and the group spent one week at the Shogawa Factory of Toyobo and three days at the Ise and Tomida Factories studying maintenance procedures and control. Twelve other establishments were visited also and they were involved in the production of spare parts, accessories, and machinery.

The main features examined were maintenance practices, production organization, techniques in the dyeing and finishing of polyester/cotton fabrics, printing machinery. and service installations. Visits also took place to producers of cast iron parts; injection moulded plastics; metallic wire for cards, rings, and travellers; rubber cots for top rollers; wire healds, heald frames, and shuttles; and textile manufacturing machinery.

All participants were able to observe that even on older type machinery it was possible to obtain products of good quality and at a high level of productivity by combining a good standard of workmanship with effective management. Good organization and experienced staff were the prerequisites for sound management decisions and speedy action.

The tour party leader prepared a report on the activities and findings of the study group.

Training Course

This was conducted by a Training Supervisor specially assigned by C. Itoh to ensure that a good understanding of the management of maintenance and production activities was developed among technical supervisory staff. In addition sessions were given to skilled and semi-skilled maintenance technicians to supplement and consolidate the other training activities in respect of maintenance procedures and the establishment of the preventive maintenance system. Aspects of quality and process control were also elucidated.

All training sessions were conducted in Japanese and Vietnamese and course material in the Japanese language was distributed to all participants. The whole series of lectures has been assembled into manual form and translated into Vietnamese for distribution to those who attended the various sessions and for reference by the personnel of other factories.

During the training periods the talk given by the supervisor and the interpretation in Vietnamese was recorded. This was a precautionary measure as it was not easy for a precise interpretation to be given on the spot. At a later date the whole series of talks and discussions will be studied and clarified by Vietnamese staff in order to make fuller use of the training material in the future.

Details of the training course schedule and the numbers of participants will be found below.

Group A - 4 days

For Directors, Deputy Directors, Departmental Heads, and Deputy Heads.

26 persons.

Group B - 3 days

For Deputy Directors, Departmental Heads, and Deputy Heads.

22 persons.

Group C - 19 days

For Senior Staff, Machine Section Group Leaders, and technicians.

	July	August
Blowing	30 and 38	
Carding	40 and 43	43
Drawing and Roving	36	39 and 39
Combing		34 and 34
Ring Spinning	50	48 and 48
Winding	39	
Yarn Preparation		62
Testing Laboratory	50	49 and 49
Roller Shop	43	

A summary of the topics covered by the course is given in annex F.

Training Equipment

The purchase of training equipment was proposed using an additional fund in the Memorandum of Understanding dated 25 July 1983. The Ministry of Light Industries requested UNDP and UNIDO to investigate how this could be financed and confirmation of implementation was provided by Project Revision F dated January 1984.

The main items provided under the arrangement were:

1 - electronic typewriter complete with daisywheels

1 - set of video equipment for filming and playback of maintenance activities

1 - duplicator

1 - overhead projector and screen used to display information during lectures.

Several films were made including the operation of the new drawframe and sizing machinery; the grinding of flats and metallic wire for carding maintenance; and preventive maintenance work on looms.

III. ACHIEVEMENTS

A. Introduction

It is believed that the most valuable overall achievement has been to demonstrate that it is feasible to keep older type machinery running in good condition by the judicious selection and purchase of spares and the implementation of properly planned and organised maintenance.

However this situation is only a foundation on which to build for reasonable quality products and consolidation is required by adherence to sound processing practice, effective process and quality control, and the implementation of correct work methods by all factory staff.

A significant benefit resulting from project activities has been the amount of enthusiasm generated in the workforce of the three factories of Viet Thang, Thang Loi, and Dong Nam. This is not to suggest that such an outlook did not exist at all before but that it was enhanced from involvement in positive action leading to tangible results.

For good results it is necessary to find the right balance between planning, discussing, and organising and the taking of action. If there is a preponderance of one or either area of activity is organised ineffectively then the results in industry are not the most appropriate.

However, the present favourable situation will deteriorate if the idea becomes prevalent that the project has ended. It is, in fact, only one possible way of creating an improved climate and it is now up to those supervising the operations of the factories to ensure that the right circumstances are created to satisfy the essential requirements of Viet Thang factory and sister concerns. This implies the spending of money and the provision of all supplies at the right time.

B. Engineering survey

The results of the survey have been set out in two reports dated February 1983 and June 1983. Implementation to the extent possible has taken place since then and progress has reached a satisfactory level of attainment. The documentation remains valid for the development of additional plans and constitutes, therefore, a dynamic feature demanding continuing study, refinement, and implementation over the next one or two years.

C. Reconditioning of machinery

The basis for this activity may be categorized into:

- improvements to machinery still in operation
- the restoration of machinery unable to operate
- the provision of a few critical items of production equipment to assist in overcoming bottlenecks.

In addition existing maintenance equipment was put into good order and new tools and specialized maintenance equipment provided.

These features resulted in an improved potential for maintenance and production of an acceptable standard in the short term.

1) Blowing Section

The purpose of processing in this section is to remove impurities from the raw cotton and arrange the material in a suitable form for the next stage in the production sequence. The reconditioned Toyoda line is now fully operational in all units and the laps produced by the scutchers consist of a suitable blend of all the components of a mixing when correct procedures are carried out.

The laps are properly formed and compact and comprise a reasonably homogeneous mixture of well-opened fibre. The regularity in weight per unit length, transversely as well as lengthways, is reaching a satisfactory standard. Furthermore, the laps unroll easily at the cards without splitting.

With the restoration of the automatic lap doffing system it is estimated that production has improved by between 73 and 21 kilograms per hour depending on whether stoppages between laps previously averaged one minute or fifteen seconds. In the first case the increase is equivalent to 20% and in the second 5% per hour. Further improvement will result from increasing the speed of the slower scutcher up to the speed of the faster one.

The benefit to overall production of automatic lap doffing can be further enhanced by increasing the weight per yard of the lap to 15 ounces and increasing the overall length of lap to 50 yards instead of the existing 44.7 yards.

The full improvement in lap regularity resulting from reconditioning may not yet have been completely realised. Trials of additional adjustments to attain normal practice have still to be made. This involves manufacturing pulleys and testing various machine adjustments and the factory staff have been advised about these measures.

Production from the reconditioned scutchers is good as is indicated in table 5 showing individual machine outputs during October.

Table 5. Production from blowing section scutchers
October 1984 - kilograms

Scutcher Number	Operating Shifts	Weight of Laps Produced	Weight per Shift	Efficiency	Remarks
3	83	114,462	1,379	82%	reconditioned
4	83	117,630	1,417	88%	reconditioned
5	63	68,220	1,083		
6	79	93,816	1,188		
7	71	73,566	1,036		
8		nil			partly dismantled
9		nil			out of order
10	81	89,730	1,108		

To illustrate the present situation concerning performance and processing standards further details relating to the reconditioned machinery will be found in tables 8 to 12 at the end of this chapter.

2) Carding

The quality of material produced by the cards has been considerable improved by providing a better processing action on the fibre resulting in a web, which is more regular, cleaner, and has fewer neps. An indication of the improvement in quality in terms of neps is given by the average figures of 47 per six square inches before and 15 per six square inches after reconditioning. This will lead to a better appearance in yarn and fabric and thus enhance quality.

As regards production this was increased by 23% for the group of 32 Toyoda cards by putting back into operation 6 cards. A further significant improvement resulted from standardising all doffer speeds to the higher of two values of 11 rpm.

Another improvement resulted in a better formation of sliver build-up in the cans passed forward to the process of drawing. This will reduce the possibility of breakages in the sliver and enhance quality.

3) Drawing

The new drawframes installed under the project are machines which provide a good standard of processing and an adequate level of production.

The performance may be judged from the production figures recorded by the second passage machines of each set during October. Assuming a weight of 425 grains (27.5394 grams) per six yards the equivalent weights of sliver production are given in table 6.

Table 6. Average production per shift (new drawframes)

Shift	Machine Number	Number of Shifts	Yards per Shift	Kilograms per Set	Efficiency
A	1099	28	80,860	742	66%
	1100	28	82,230	754	67%
B	1099	27	78,150	718	64%
	1100	27	80,940	744	66%
C	1099	28	86,030	790	70%
	1100	28	81,060	744	66%

It was noticed that the production recorded over several consecutive shifts was similar and many figures appeared to represent a pattern of convenient numbers. On enquiry the information was given that production was being limited in order to balance production between machine sections. Clearly it would be advantageous to maximise production from this new equipment in order to obtain the benefit of superior processing quality. At present the sliver from the two sets of drawframes is supplying four type FAB roving frames each of 96 spindles.

The reconditioning of two sets of existing drawframes has substantially improved the standard of processing. The drafting assembly of No. 8 has been restored by new fluted rollers and some suitable parts transferred to No. 7. Clearers on all four frames have been rehabilitated and set up correctly so that the effect on quality resulting from detrimental accumulations of fibre and waste have been largely eliminated.

These drawframes have four deliveries per machine and operate at a speed of approximately 80 yards per minute. The performance during October as recorded by the second passage machine is given below.

Table 7. Average production per shift (old drawframes)

M/c	Shift A			Shift B			Shift C		
No.	Yards	kgs	Eff.	Yards	kgs	Eff.	Yards	kgs	Eff.
7	25,600	390.9	67%	29,450	449.7	77%	33,410	510.2	87%
8	27,170	414.9	71%	29,400	448.9	77%	32,560	497.2	85%

4) Roving

All twevle type FAS roving frames are now in operation. Thus the one additional frame that was put back into running condition has increased production from this group of machines by 9.1%. Better performance from the other two reconditioned frames has brought this up to an overall improvement of 10%. The re-built frame is providing feed material for at least seven additional ring frames out of a total installed complement of 104 (Toyoda and Howa).

The main restoration work on type FAB roving frames involved the drafting systems and building mechanisms. Frame No. 13 was provided with new fluted rollers. However, short-term periodic variations in the roving strands produced cannot be assessed as the electronic evenness teater is out of action.

An examination of the results of weighing 30 yard lengths of roving indicate that variation in this parameter is less on some days than others indicating that control of feeding in the blowing section and of material feeding to machines prior to the roving section needs improving. Machine settings also should be standardized and carried out with care.

5) Ring Spinning

The target of yarn production given in the project document is 2,148 tonnes per annum. This was based on 43 ring frames whereas only 39 have been reconditioned thus reducing potential production by 9.3% to 1,948 tonnes.

It should be noted that the obtaining of figures that reflect the actual production of yarn from the ring frames at Viet Thang is made difficult because there is no weighing of each doffing of full ring tubes as it is removed from the frame. Furthermore, there is no equipment available to carry this out in a practical way. However, a record of production obtained by weighing is kept from the process subsequent to ring spinning and details are given at the end of the chapter but it should be borne in mind that only totals for each count of yarn in production in the whole of the ring spinning section are obtained.

Using figures obtained from the production of eight ring frames for the month of October 1984 as recorded on machine counters, it appears that 58.88 kilograms per frame per shift have been produced. Assuming 900 shifts per annum this would result in the production of 2,066 tonnes of yarn from 39 frames.

However the estimated production target in the project document was based on 82% efficiency and it is believed that the efficiency during October was higher than such a figure. It is not considered that this would be a realistic basis taking all circumstances into account over a twelve months' period. Furthermore, the figures as recorded by the production counters are only an approximation to actual production since functioning is based on the revolutions of the front roller of the drafting system and the performance of 400 individual spindles cannot be measured.

In a trial carried out on ring frame No. 23 the time to produce a full doff of Ne 20s yarn on ring tubes was noted as 260 minutes. Yarn was unwound and measured from five ring tubes taken from each side of the frame resulting in an average length of 3,109.15 yards for each ring tube. This is equivalent to 83.95 grams of 20s on each ring tube.

The production rate was calculated as 430.5 inches per minute and with this as the basis and using the figure of 82% for efficiency production per frame per shift of eight hours would be 50.83 kilograms. Thus total production from 39 ring frames would be 1,748 tonnes per annum at a spindle speed of 8,200 rpm.

The spindle speed used to calculate the project target was 9,000 rpm. Using the ratio of these two speeds results in a production figure of 1,958 tonnes. Thus the target can be matched provided that the factory arranges the operation of the ring frames in accordance with recommendations.

At the present time the factory has no ring frame pulleys that would give the average speed of 9,000 rpm. However, one frame has been running at 9,575 rpm since October and arrangements are being made to obtain some pulleys to give a speed of 9,000 rpm.

Details for Ring Frame No. 23

Spindle speed	8,200 rpm
Twist change wheel	44 t
Tin roller wheel	50 t
Front roller speed by tachometer	142 rpm

Average length of yarn unwound from ten ring tubes:

3,109.15 yards

Period of time to produce one full doff:

260 minutes

Rate of production: 430.5 inches per minute

Ring frame production per hour:

$$(430.5 \times 60 \times 400 \times 0.82) \div (36 \times 840 \times 20)$$

14.0083 lbs

or 6.354 kgs

Production of Ne 20s per annum:

$6.354 \times 39 \times 7{,}200$ = 1,784.2 tonnes

Production of Ne 20s per annum with spindle speed 9,000 rpm:

1,958.3 tonnes

6) Weaving

The target figure of fabric production given in the project document is 15.9 linear metres per annum.

In November 1981 there were 272 looms out of operation from the total complement in Weaving I of 864. It was estimated, therefore, that production would be based on 600 looms at the start of the project planned for October 1982. This implied that machinery reconditioning would start in June 1983 according to the schedule given in the project document. Then it was expected that 200 looms would be brought back into production as a result of the impetus given by the project activities resulting in a final total of 800.

In fact machinery reconditioning in the loom section did not start until April 1984 and by that time 784 looms were in operation (as compared with 704 at the time of the engineering survey in December 1982). Thus, only 40 looms were brought back into operation during the assignment of the Japanese supervisor plus two more that the weaving technicians arranged themselves. This made a total of 826 looms supplied with warp beams and in operation in September 1984.

The situation concerning the accurate checking of fabric production is difficult since there are no pick counters on the looms to record actual production in terms of the numbers of weft picks inserted into fabric. Usually pick counters are read at the end of each shift and details are then prepared cumulatively so that a record of total production per loom or for a group of looms (e.g. those producing one sort of fabric) is available at the end of a specified period. Performance can then be judged by calculating precise efficiency figures.

The only available alternative is to measure all rolls of fabric subsequent to their removal from the looms. However there is some uncertainty in consistently and accurately relating measurements to the period during which the fabric was produced. Thus some fabric may go into storage without being inspected and measured or may be taken from stocks produced in previous periods.

In spite of the problems related to this method it is the only one in use at Viet Thang Factory and has been applied for a long period. A Checking Form is completed for each roll of fabric giving details of the loom identification number, dates and shifts to which output is related, the length produced according to the shift, and the quality assessment for each shift length. The total length for the roll of cloth is also shown and such figures vary between 80 and 140 metres.

The details from all such forms are summarised on a Grey Goods Form, which provides the total of one day's production according to the sort of fabric as indicated by the measurements

completed over three shifts. Stock details, cumulative figures of output for the current month, and deliveries to various destinations - such as the finishing department - are also included.

Unfortunately, to obtain production figures for the fortytwo reconditioned looms would not be representative of the departmental performance since it is impossible as yet for the factory to provide operatives on a steady basis to run the looms or consistent attention from technicians to carry out repairs and maintenance work.

It is necessary, therefore, to examine overall production figures relating to the department as a whole to obtain an indication of performance. The measurement of fabric rolls has been used to indicate production from the weaving department during September and October 1984 when 826 looms were operational. The result is expressed in terms of average output per loom per shift and is shown below:

Sort	Looms	Metres per Loom per Shift	Theoretical Metres per Loom per Shift of 7.5 hours	Efficiency
Calico	571	18.01	33.46	53.83%
4444	175	18.24	43.50	41.93%
Safety	64	22.37	52.20	42.85%
Gauze	16	20.43	71.18	28.70%

826 looms in total

However the factory usually makes certain allowances for such factors as operative absence, shortage in weft supplies, mechanical or electrical breakdown, smash, etc. lasting throughout one shift. Thus the adjusted figures for September and October as recorded by the factory are:

Sort	Looms	Metres per Loom per Shift	Theoretical Metres per Loom per Shift of 7.5 hours	Efficiency
Calico	545	18.87	33.46	56.39%
4444	149	21.41	43.50	49.21%
Safety	59	24.26	52.20	46.47%
Gauze	15	21.78	71.18	30.59%

768 looms in total

It should be noted that the performance of the looms at Viet Thang suffers from the disadvantage of weaving operatives having to replenish weft manually in a loom that is designed for this procedure to be carried out automatically by machinery mechanism.

However, the target production recorded in the project document was based on 60% efficiency, which is considered to be a reasonable expectation under the conditions existing in the weaving department. Using this assumption it is clear that the present situation is unsatisfactory and requires a serious investigation.

This would include the verification of the accuracy of production figures and the related estimate of operating looms. Other features requiring assessment would include the overall mechanical condition of the looms, the continuity of warp and weft yarn supplies, the competence of technicians and operatives and the consistency of their attention, the rate of labour turnover, the incidence and causes of loom stoppages and unproductive periods, and the air conditions applying in the work areas during twentyfour hours.

Taking the factory figures at their face value it would appear that they only have the capacity to operate 768 looms on a continuous basis. If the outcome of the type of investigation outlined above is unfavourable then it is clearly uneconomical to attempt to run 826 looms and steps should be taken to make a significant reduction to the total.

The figures of production in the weaving department up to the end of October as recorded by the factory are shown in Column 1 in the list below. However, it appears that measurement of fabric rolls is taking place about ten days after they have been removed from the looms. This is an unacceptable situation from the aspects of the checking of the quantity and quality in relation to the shift in which fabric was woven, and the keeping of records.

The quantities given in Column 1 have been produced during 791 shifts or an equivalent total of 264 working days (from 304 calendar days). Since there is an approximate ten day delay in measuring and recording output, the given production figures should be adjusted by 264 ÷ 254, i.e. enhanced by 3.9% - say 3.0%. Then figures more closely representative of the actual situation would read as given in Column 2.

To estimate the expected annual production figures for 1984 the ratio 900 : 791 is applied to the figures from Column 2. It is believed that the total production will be of the order of 14,256,755 linear metres.

Sort	Recorded Production to end of October	Adjusted Production 264/254 days	Expected Production 900/791 shifts
	(1)	(2)	(3)
Calico	8,460,332 mtrs	8,714,142 mtrs	9,914,952 mtrs
4444	2,579,518.1	2,656,904	3,023,026
Safety	1,072,358.7	1,104,530	1,256,734
Gauze	52,940.8	54,529	62,043
	12,165,149.6	12,530,105	14,256,755

To put the expected production from Weaving I in 1984 into perspective it may be noted that the details given by the factory for 1982 and 1983 are:

Sort	1982 metres	1983 metres
Calico	8,776,000	10,302,423
4444	2,585,000	3,086,195
Khaki	268,000	174,411
Total	11,629,000	13,563,029

Note:

After this report was prepared the figures for twelve months' production in 1984 from Weaving I Department of Viet Thang Factory were given as:

	Linear Metres
Calico	10,431,449.2
4444	2,856,368.8
Safety	1,242,476.7
Gauze	159,133.3
TOTAL	14,689,428.0

There had been some confusion over the number of shifts worked per period owing to a misreading of information given in Vietnamese and English but differences were only slight. They would reduce the output calculated in Metres per Shift but would not significantly alter the conclusions reached. The total number of shifts worked during the year was 971.

Table 8. Testing laboratory conditions

Date September	Temperature °C	Relative Humidity %
15	34.4	58
17	36	60
18	32	60
20	32	55
21	33	60
22	32.7	58
24	33.8	58
25	34.4	58
26	33.3	60
27	35	62
28	33.3	60

Table 9. Reconditioned blowing line; lap production scutcher No. 3

Date	Shift A						Shift B						Shift C					
Sept						Reject						Reject						Reject
1984	Total	Heavy	%	Light	%	%	Total	Heavy	%	Light	%	%	Total	Heavy	%	Light	%	%
14							83	2	2.4	6	7.2	9.6	75	10	13.3	17	22.7	36.0
15	85	9	10.6	11	12.9	23.5	70	8	11.4	9	12.9	24.3	84	21	25.0	5	6.0	31.0
17	90	13	14.4	7	7.8	22.2							33	6	18.2	2	6.1	24.3
18	79	4	5.1	5	6.3	11.4	80	6	7.5	7	8.8	16.3	86	9	10.5	6	7.0	17.5
19	85	4	4.7	6	7.1	11.8	54	-	-	1	1.9	1.9	84	4	4.8	10	11.9	16.7
20							80	6	7.5	9	11.3	18.8	57	5	8.8	9	15.8	24.6
21	67	13	19.4	7	10.5	29.9	81	3	3.7	9	11.1	14.8	77	4	5.2	5	6.5	11.7
22	84	4	4.8	11	13.1	17.9	80	3	3.8	8	10.0	13.8	85	3	3.5	5	5.9	9.4
24	98	5	5.1	3	3.1	8.2	60	9	15.0	9	15.0	30.0						
25	66	4	6.1	5	7.6	13.7	80	5	6.3	2	2.5	8.8	68	3	4.4	5	7.4	11.8
26	77	5	6.5	3	3.9	10.4	92	10	10.9	4	4.3	15.2	84	1	1.2	4	4.8	6.0
27	70	8	11.4	7	10.0	21.4							90	1	1.1	7	7.8	8.9
28	94	6	6.4	6	6.4	12.8	79	15	19.0	10	12.7	31.7	78	2	2.6	3	3.9	6.5

Heavy Lap - weight is higher than nominal by more than 300 grams

Light Lap - weight is lower than nominal by more than 300 grams

The percentage of laps to be rejected is excessive

Table 10. Reconditioned blowing line; testing of laps produced

Width 39.6 inches - Target Weight 14.6 ounces/yard

Yard-to-Yard Test (40 weighings) Ounces

Date Sept.	Scutcher Number	Lab. Report Average	Lab. Report C.V.%	Ounces Maximum	Ounces Minimum	Range	Median Weight
14	3	13.7	1.79	15.2	13.1	2.1	13.8
15		14.9	2.39	15.8	13.6	2.2	14.7
17		14.4	2.25	15.6	13.7	1.9	14.4
18		13.9	2.57	15.5	13.0	2.5	14.0
19		14.0	2.19	16.1	13.3	2.8	14.2
20		14.5	2.15	15.1	13.4	1.7	14.4
21		14.2	1.79	15.5	13.5	2.0	14.2
22		14.2	2.30	15.1	13.3	1.8	14.2
24		14.0	2.49	15.4	13.3	2.1	14.2
25		13.9	1.81	14.9	13.0	1.9	14.0
26		14.4	1.95	16.0	13.4	2.6	14.3
27		14.0	1.74	15.5	13.2	2.3	14.6
28		14.7	2.05	15.6	13.9	1.7	14.7
Average		14.2	2.11	15.5	13.4	2.1	14.3
14	4	13.8	2.74	15.7	13.0	2.7	13.9
15		14.4	1.98	15.0	13.4	1.6	14.3
17		14.7	3.15	15.7	13.2	2.5	14.5
18		14.4	2.60	15.2	13.0	2.2	14.2
19		14.4	3.12	16.2	13.2	3.0	14.4
20		14.9	2.88	16.3	13.4	2.9	14.6
21		14.1	2.78	15.4	13.0	2.4	14.4
22		14.6	3.03	15.5	13.0	2.5	14.4
24		14.0	2.34	15.2	13.3	1.9	14.2
25		14.2	2.42	15.7	13.1	2.6	14.1
26		15.1	3.06	16.0	13.8	2.2	14.9
27		14.7	2.59	15.8	13.5	2.3	14.6
28		14.1	1.56	15.4	13.1	2.3	14.1
Average		14.4	2.64	15.6	13.2	2.4	14.4

Table 11. Reconditioned blowing line; scutchers No. 3 and 4
Weight across 1/3 width of Scutcher Lap
One Yard Lengths (ounces)

	Scutcher No.3				Scutcher No.4			
September	Left	Middle	Right	Total	Left	Middle	Right	Total
14	5.2	3.8	5.0	14.0	5.3	4.3	5.1	14.7
15	4.9	4.2	5.0	14.1	4.4	3.5	4.4	12.3
17	4.4	3.5	4.1	12.0	4.5	3.6	5.4	13.5
18	4.8	4.7	4.2	13.7	5.0	4.2	4.6	13.8
19	5.1	3.5	4.4	13.0	5.0	4.0	4.9	13.9
20	4.7	4.1	4.8	13.6	5.1	4.0	5.1	14.2
21	4.4	4.2	4.2	12.8	4.2	4.1	5.4	13.7
22	4.7	3.9	3.9	12.5	4.6	4.4	4.8	13.8
24	4.4	4.1	5.1	13.6	4.8	4.4	5.5	14.7
25	4.6	4.0	4.0	12.6	4.9	4.0	4.6	13.5
26	5.2	4.6	4.7	14.5	5.4	4.0	4.2	13.5
27	4.6	4.4	4.0	13.0	4.9	4.3	4.5	13.7
28	5.0	4.6	4.4	14.0	5.3	4.0	5.0	14.3
Total	62.0	53.6	57.8	173.4	63.4	52.8	63.5	179.6
Average	4.8	4.1	4.5	13.3	4.9	4.1	4.9	13.8

Nominal weight per yard as reported by factory 14.6 ounces

Usual weight per yard as processed 14.3 ounces

Table 12. Reconditioned blowing line; sampling of laps

One yard lengths of Scutcher Lap

Weight across one third width - ounces

Machine Number	Date	Sampling	Left Side	Middle	Right Side	Total Weight
4	Oct. 27	F*	4.4	4.0	5.2	13.6
		M	5.0	4.5	5.2	14.7
		I*	5.4	4.2	5.3	14.9
		Average	4.9	4.2	5.2	14.3
3	Oct. 27	F*	4.7	4.0	5.2	13.9
		M	5.6	4.2	5.1	14.9
		I*	4.8	4.3	5.0	14.1
		Average	5.0	4.2	5.1	14.3
4	Oct. 29	F*	4.9	4.3	5.2	14.4
		M	4.9	4.2	4.3	13.4
		I*	4.5	4.4	4.9	13.8
		Average	4.8	4.3	4.8	13.9
3	Oct. 30	F*	4.7	4.5	4.8	14.0
		M	4.7	4.8	5.1	14.6
		I*	5.2	4.5	4.6	14.3
		Average	4.9	4.6	4.8	14.3
		Overall Average	4.9	4.3	5.0	14.2

F* Final wound part of Lap (taken approx. 5 yards from end)

M Middle wound part of Lap

I* Initial wound part of Lap (taken approx. 5 yards from end)

Table 13. Ring frame production, October 1984

Ring Frame Number	Spindle Speed	Number of Shifts			Total Hanks Produced			Hanks per Shift				Total Kilograms		
		A	B	C	A	B	C	A	B	C	Aver.	A	B	C
23	8,497	27	27	28	1,879	1,869	1,936	69.6	69.2	69.1	69.3	1,691	1,682	1,742
25*	8,258	27	27	28	1,527	1,498	1,546	56.6	55.5	55.2	55.8			
27	8,380	27	27	28	1,726	1,686	1,775	63.9	62.4	63.4	63.2	1,553	1,517	1,598
29	8,380	27	27	28	1,712	1,702	1,741	63.4	63.0	62.2	62.9	1,541	1,532	1,567
31	8,225	27	27	28	1,749	1,689	1,811	64.8	62.6	64.7	64.0	1,574	1,520	1,630
33	8,325	27	27	27	1,849	1,836	1,825	68.5	68.0	67.6	68.0	1,664	1,652	1,643
35	8,165	27	27	28	1,722	1,716	1,768	63.8	63.6	63.1	63.5	1,550	1,544	1,591
37	9,575	27	27	28	1,872	1,813	1,929	69.3	67.2	68.9	68.5	1,685	1,632	1,736
39	8,201	27	27	28	1,747	1,726	1,775	64.7	63.9	63.4	64.0	1,572	1,553	1,598
41*	8,183	27	27	28	2,034	2,020	2,067	75.3	74.8	73.8	74.6			

* The figures obtained from the production counter are inconsistent with the average situation

Total production from eight frames Shift A 12,830 kg Shift B 12,632 kg Shift C 13,105 kg

Production per Frame per Shift 58.88 kg Yarn count Ne 20s

Table 14. Spinning Department I - yarn production 1984
(kilograms)

Month	Shifts	Count Ne					
		30s	20s	20s(v)	20s/2	10s	8.3s
January	78	30,306	152,573	39,553	16,066	42,005	40,282
February	69	26,148	144,107	26,723	12,009	40,834	34,146
March	83	31,835	167,932	34,364	14,397	67,658	40,640
April	80	45,159	139,713	33,569	10,371	43,087	52,545
May	81	48,336	134,755	30,121	12,504	53,820	65,981
June	81	47,936	162,534	-	16,633	52,062	36,000
July	82	42,640	167,215	-	16,507	50,872	73,310
August	81	39,585	172,769	-	16,606	48,653	70,803
September	77	26,061	197,303	-	13,201	41,375	92,922
October	82	25,092	229,537	-	17,810	36,878	97,277

Monthly Totals

January	February	March	April	May	June
320,785	283,967	356,826	324,444	345,517	315,165

July	August	September	October
350,544	348,416	370,862	406,594

Note:
These details are obtained by weighing the output from the process subsequent to Ring Spinning, i.e. Cone Winding.

Table 15. Weaving I production 1984
metres

Sort			Metres per Loom per Shift
	Jan/Feb/Mar	(236 shifts)	
Calico	2,491,016.6	592 looms	17.83
4444	660,863.5	136	20.59
Safety	272,508.6	56	20.62
		784	
	Apr/May/June	(238 shifts)	
Calico	2,565,765.6	573 looms	18.81
4444	814,086	158	21.65
Safety	350,257.3	55	26.76
		786	
	July/August	(155 shifts)	
Calico	1,737,392.3	542 looms	20.68
4444	587,614.5	201	18.86
Safety	217,668.3	67	20.96
		810	
	Sept/October	(162 shifts)	
Calico	1,666,157.5	571 looms	18.01
4444	516,954.1	175	18.24
Safety	231,924.5	64	22.37
Gauze	52,940.8	16	20.43
		826	

IV. UTILIZATION OF PROJECT RESULTS

The project has clearly demonstrated at Viet Thang Factory that by the judicious selection of spares and the conscientious application of sound management practices, maintenance skills, and maintenance procedures it is possible to restore old machinery so that it will operate at a satisfactory level of productivity.

It is necessary, however, to be aware of the optimum level taking into account what is technically feasible, the skills required for implementation, and the costs involved. Factory personnel should be prepared to devote time to these considerations and to carry out carefully planned trials to investigate possibilities.

Moreover, it is necessary also to compute the full costs of such reconditioning work taking into account local and foreign currency expenditure and examine how these compare with the purchase of new machinery. This would involve various analyses and an evaluation of the respective results and benefits.

The basis for reconditioning activity was the compilation of the list of spares and accessories resulting from the engineering survey. Such details together with the descriptions of machine condition remain on record in the Toyoda Report of February 1983. Much information remains to be utilised since implementation was limited by the finance available under the UNDP budget allocation.

However basic such reconditioning work is, it requires a system of maintenance to keep the machines functioning satisfactorily. This necessitates work to be specified, schedules to be arranged, and adequate maintenance workrooms, tools, and equipment to be available. As a result of project activities the preventive maintenance system has been established covering all sections of machinery in the departments of spinning, yarn preparation, and weaving. Since the effectiveness of the performance of a vertically organised factory is highly dependant on the production from a weaving department, the most essential areas of processing have been covered by the system.

Groups of maintenance technicians in all machine sections are attending to their machine complements in accordance with the stipulations recorded in work specifications. This is being done in conformity with the schedules laid down and updated where necessary. Lubrication using oils and greases of satisfactory quality is being carried out and efforts need to be continued to avoid using inferior grade material such as treated waste oil. Care in the cleaning of machinery is being exercised and the monitoring of the standard attained is being carried out but such features need constant attention for good results.

By repairing and adjusting existing maintenance equipment at the factory and by the provision of a number of other items of specialised equipment, such as the ring spindle oiling unit and the roller treatment unit, maintenance facilities are now of a better standard. Consequently correct use should lead to better machine condition for some time to come.

Furthermore, although some improvements to maintenance workrooms had already been carried out it has since been stated that written recommendations left with the factory by the Toyobo technical team will be fully implemented with slight modifications by February 1985.

It should be borne in mind that the full benefits of preventive maintenance are closely linked to the availability of spares giving adequate useful life in service and the quality of workmanship practised by all maintenance staff. Thus, follow-up investigation is needed for a fully effective assessment of the project results already obtained.

Since the full implementation of the system is still in its early stages it is premature to assess accurately the effectiveness of all aspects of its operation. However, since one of the expected benefits to accrue is considered to be less machine downtime, it will be necessary to check the developing situation. This will only be possible by devising suitable forms and by arranging for staff to record details accurately and conscientiously.

The number of technicians who were trained during the project activities comprises 62 in spinning, 12 in yarn preparation, and 30 in weaving at Viet Thang Factory; 30 in spinning at Thang Loi Factory; and 35 in spinning at Dong Nam Factory. In addition 14 technicians in the finishing department at Viet Thang supplemented their knowledge and experience by working with three Japanese supervisors during reconditioning work lasting seven weeks. Thus, the overall total of trainees who benefitted from the project is 183.

These technicians are now in a position to use their improved knowledge and skills to keep machinery operating satisfactorily provided circumstances are favourable. Such a situation would be dependant on good organization, appropriate motivation, the utilization of initiative in overcoming problems, and a reasonable supply of materials, tools, and maintenance accessories.

In order to benefit fully from the knowledge gained in carrying out machinery reconditioning work and in implementing effective maintenance procedures it will be essential to arrange for such activities to be discussed, planned, and extended over additional groups of machinery and for other groups of technicians.

Such steps will need to be planned and organised by UTE. Effective implementation will depend on the attention given to the preparations, the appropriate assignment of duties to management staff, and the calibre of instructors selected to carry out the work of supervising and training.

It is believed that the management personnel involved in production and maintenance have benefitted from their studies and discussions relating to management and technology and have received a closer insight into the prerequisites necessary to operate factories successfully. This is reflected in the acceptance of the responsibility of arranging for maintenance activities to be carried out systematically and carefully and in the planning and organising of an extension to the reconditioning programme at Viet Thang Factory. Furthermore, there is serious discussion taking place relating to factory organization and this has been initiated by UTE.

The development of this situation should be consolidated by the promotion and implementation of sound policies concerning procurement, production, and aspects of marketing for home and export supplies of fabrics. Expectations in factory performance need to be raised on a carefully planned and justified basis and staff need to be allowed sufficient time to plan for these developments and to monitor results.

Furthermore, by using the technical reference books supplied by the project, there is a fund of back-up knowledge available concerning the management of maintenance and production. Many aspects of textile technology are also covered and the books could be made available for study on factory premises to those with a good knowledge of English. Others will need to be assisted by such people during individual discussions and formal training sessions.

It is understood that translations of important relevant sections of such books are in progress. On a limited scale this is extremely useful but the complete translation of a whole series of books is a rather laborious process and may not lead to the most effective results.

In general it is considered that project results are being effectively utilised at the present time but that the climate generated needs to be fostered and sustained for more lasting benefit.

Annex A

INTERNATIONAL STAFF

Haworth, T.M.	United Kingdom	Chief Technical Adviser March 1983 - February 1985
Watanabe, M.	Japan	Representative of C. Itoh & Co Ltd Visits throughout project duration
Watanabe, E.	Japan	Team Leader February 1984 - November 1984
Tsumori, K.	Japan	Assistant Team Leader April 1984 - November 1984
Murayama, S.	Japan	Blowing/Carding Supervisor March 1984 - November 1984
Murata, M.	Japan	Drawing/Roving Supervisor March 1984 - November 1984
Hirose, K.	Japan	Spinning/Winding Supervisor March 1984 - November 1984
Hayashi, M.	Japan	Yarn Preparation Supervisor April 1984 - October 1984
Hashioka, M.	Japan	Weaving Supervisor April 1984 - October 1984
Shinagawa, M.	Japan	Finishing Supervisor June 1984 - August 1984
Fujimoto, N.	Japan	Printing Supervisor June 1984 - July 1984
Nishikawa, K.	Japan	Printing Supervisor June 1984 - July 1984
Iwai, E.	Japan	Drawframe Installer May 1984 - June 1984
Kawamata, H.	Japan	Sizing Installer May 1984 - June 1984
Tanaka, M.	Japan	Training Supervisor June 1984 - September 1984

Annex B

SENIOR COUNTERPART STAFF

The details given below relate to those persons most directly concerned with project activities, results, or benefits.

** indicates frequent contact and advisory discussions
* indicates periodic contact and advisory discussions

Mr. Ngo Van Tiem	Dyeing Engineer
Deputy Director - Production	Year of appointment: 1976
University of Hanoi 1956 - 1960	
Mr. Tran Van Nho **	Spinning Engineer
Deputy Director - Technical	Year of appointment: 1976
University of Hanoi 1963 - 1968	
Mr. Vo Quang Ti	Economic Engineer
Deputy Director - Economic Affairs	Year of appointment: 1976
University of Hanoi 1960 - 1964	
Ms. Dinh Thi Hanh *	Dyeing Engineer
Head of Quality Control	Year of appointment: 1983
University in Poland 1970 - 1975	
Mr. Tran Huu Thu	Economic Engineer
Head of Register and Planning	Year of appointment: 1977
University of Hanoi 1967 - 1971	
Mr. Do Van Dap *	Mechanical Technician
Head of Electro-Mechanical	Year of appointment: 1978
Technical High School in Hanoi 1956 - 1959	

Mr. Le Quoc An *
Head of Processing
University of Saigon 1970 - 1974
Dyeing Engineer
Year of appointment: 1980

Ms. Tran Thi Thieu Hai
Head of Supply
Technical High School in Hanoi 1956 - 1959
Dyeing Technician
Year of appointment: 1984

Ms. Nguyen Thi Kim
Head of Accounting
M.O.L.I. Technical School in Hanoi 1962 - 1965
Accounting and Finance Technician
Year of appointment: 1978

Mr. Luu Duc Tu
Head of Training School
University of Hanoi 1972 - 1976
Economic Engineer
Year of appointment: 1980

Mr. Nguyen Huu Thung *
Head of Spinning I
University of Hanoi 1972 - 1976
Spinning Engineer
Year of appointment: 1981

Mr. Nguyen Dang Giao
Head of Weaving I
Technical School in Nam Dinh 1965 - 1968
Mechanical Technician
Year of appointment: 1981

Ms. Cao Thi Thanh *
Dy. Head Spinning I - Production
University in Bulgaria 1972 - 1977
Spinning Engineer
Year of appointment: 1981

Mr. Bui Nguyen Tien **
Dy. Head Spinning I - Technical
University of Hanoi 1974 - 1978
Spinning Engineer
Year of appointment: 1981

Ms. Nguyen Thi Tham
Dy. Head Weaving I - Production
University of Hanoi 1972 - 1976
Weaving Engineer
Year of appointment: 1981

Mr. Cao Xuan Ngoc **
Dy. Head Weaving I - Technical
M.O.L.I. Technical School in Hanoi 1972 - 1975
Weaving Technician
Year of appointment: 1982

Annex C

STUDY TOUR PARTICIPANTS

MOLI - Hanoi	
Mr. Phan Trong Tiem	External Affairs
UTE - Ho Chi Minh City	
Mr. Ho Sy Linh	Head of Technical Department
Ms. Phan Thi Hanh	Interpreter
Mr. Pham Van Luc	Interpreter
Ms. Luu Thi Thu	Interpreter
Viet Thang Factory	
Mr. Tran Van Nho (Leader)	Deputy Director - Technical
Ms. Do Thi Chai	Carding Section Leader Spg I
Mr. Vu Van Nhuan	Dy. Head Technical - Weaving II
Mr. Cao Xuan Ngoc	Dy. Head Technical - Weaving I
Ms. Ngo Thi Minh Phu	Dy. Head Technical - Spinning II
Mr. Bui Nguyen Tien	Dy. Head Technical - Spinning I
Mr. Phung Xuan Dao	Yarn Preparation Technical Cadre
Mr. Vu Van Sau	Ring Frame Group Leader Spg II
Mr. Nguyen Huu Thung	Head Spinning I
Mr. Nguyen Dang Giao	Head Weaving I
Mr. Hoang Van To	Dy. Head Technical - Weaving III
Mr. Pham Van Hue	Dy. Head Maintenance - Finishing
Thang Loi Factory	
Mr. Truong Na	Deputy Director
Mr. Do Van Cuong	Dy. Head Spinning II
Dong Nam Factory	
Mr. Hoang Xuyen	Deputy Director
Mr. Phan Van Tue	Head of Spinning Maintenance

Annex D

STUDY TOUR VISITS, 1983

1. Nov. 30 - Dec. 7 — 21 persons

   Toyobo Co. Ltd
   Shogawa and Shogawa Dyeing Mills
   Production of combed cotton yarns
   and maintenance arrangements

2. Dec. 7 — 21 persons

   Takagi Manufacturing Co. Ltd
   Plastic injection moulding

3. Dec. 7 — 21 persons

   Takagi Seiki Co. Ltd
   Plastic thermohardening

4. Dec. 9 — 21 persons

   Toyobo Engineering Co. Ltd
   Company organization

5. Dec. 9 — 21 persons

   Kanai Juyokogyo Co. Ltd
   Metallic wire for cards, rings, travellers

6. Dec. 10 — 21 persons

   Nippon Wire Heald Manufacturing Co. Ltd
   Steel wire healds for weaving

7. Dec. 10 — 21 persons

   MIC Industrial Co. Ltd
   Aluminium heald frames

8. Dec. 10 — 21 persons

   Miyawaki Industrial Co. Ltd
   Shuttles, picking sticks

9. Dec. 12 - Dec. 13 — 16 persons

   Toyobo Co. Ltd, Ise Mills
   Production of polyester/cotton yarns
   and fabrics. Maintenance requirements

10. Dec. 12 — 5 persons

Daido-Marta Dyeing Co. Ltd
Fabric printing

11. Dec. 13 — 5 persons

Kyoto Machinery Co. Ltd
Manufacture of dyeing and finishing machinery

12. Dec. 14 — 21 persons

Kureha Rubber Co. Ltd
Spinning top roller cots

13. Dec. 15 — 21 persons

Toyobo Co. Ltd, Tomida Mills
Production of fine cotton yarns and sewing thread

14. Dec. 16 — 21 persons

Toyoda Automatic Loom Works Ltd
Kariya Factory and Showroom
Textile machinery manufacturing

15. Dec. 16 — 21 persons

Toyoda Automatic Loom Works Ltd
Obu Factory
Manufacture of cast iron parts

Note:

The main purpose of the Study Tour was to examine the organization and procedures necessary for ensuring the effective maintenance of machinery in textile manufacturing plants. This involved an understanding of the background details relating to the system of preventive maintenance, which was to be established in the factories of the participants in Ho Chi Minh City.

Thus, it was intended to demonstrate the benefits of properly organised and managed factories, how machinery life could be preserved, how accurate machine settings contributed towards good performance and quality, how productive capacity could be maximised, and what was necessary to implement such aims.

Annex E

OUTLINE OF TRAINING COURSES

Lecturer: Mr. Tanaka

A. Technical Management Seminar (Senior Course)

1. Management of Factory

1.1 Organization of factory

1) Connection diagram of factory organization

2) Organization chart of factory

1.2 Control index

1) Number of personnel employed per bale

2) Output of one spindle per diem

1.3 Cost control

1) Spinning yield

2) Manufacturing cost

1.4 Safety control

1) Importance of safety

2) Accident statistics

1.5 Sanitary control

1) Cause of disease

2) Control of working environment

3) Protective and first aid material

4) Education of safety and sanitation

2. Education and Training (Case of TOYOBO)

2.1 Central Training Institute of TOYOBO

2.2 Training at each textile mill

1) Job classification system GB-GA-SB-SA-K

2) Technician's card (Training material)

3) Assessment points

4) Training at Maintenance Centres

5) SA training

3. Preventive Maintenance System

3.1 Performance control

1) Lowering of performance

2) Fundamental activities

a) Periodical check of machinery and equipments

b) Adjustment and maintenance (Daily maintenance)

3.2 Effect of preventive maintenance

3.3 Policy of setting up preventive maintenance

3.4 Maintenance scheme
    1) Maintenance plan
    2) Personnel plan and scheduling
    3) Order placing of required parts and accessories

4. Cotton
4.1 Ginning and baling
4.2 Features of cotton at each production area
4.3 Cotton grading
    1) Grade
    2) Staple length
    3) Character
4.4 Cotton mixing
    1) Object of cotton mixing
    2) Caution at cotton mixing

5. Man-made and Synthetic Fibres
5.1 Selection of fibres (fibre length)
5.2 Number of fibres constituting yarn
5.3 Fibre length at being mixed with cotton
5.4 Fibre properties
    1) Staple length over the limited cut length
    2) Fineness
    3) Tenacity and elongation
    4) Knot strength
    5) Crimp
    6) Friction coefficient
    7) Oiling agent

6. Spinning Process
6.1 Action of spinning process
6.2 Blow room process
    1) Object
    2) Machinery arrangement
    3) Main action of each machine
6.3 Carding process
    1) Object
    2) Description of carding engines
    3) Important control items

6.4 Drawing process
1) Object
2) Important control items
6.5 Roving process
1) Object
2) Important control items
6.6 Ring spinning process
1) Object
2) Important control items
3) Quality control
6.7 Winding process
1) Object
2) Important control items
3) Quality control

B. Technical Management Seminar (Middle Course)

1. Calculation Method of Conversion Ratio of Personnel and Manufacturing Cost
1.1 Decision of standard spinning machinery
1.2 On the basis of ring spinning frame
1.3 On the basis of roving frame
1.4 On the basis of blow room machinejry to drawframe
1.5 On the basis of winder
1.6 Other personnel
1.7 Personnel of other departments
1.8 Calculation of required personnel per bale
1.9 Conversion ratio of manufacturing cost
1.10 Conversion ratio of power

2. Preventive Maintenance Items
Detail of preventive maintenance system per each process (Frequency, personnel and time required, number of machines and contents of maintenance, etc.)

3. Function Examination Items
Detail of function examination per each process

4. Product Control

4.1 Raw Material Control

1) Cotton classing

a) Cotton fibre

b) Mechanical classing

Fibre length/Fineness of fibre/Fibre maturity/Fibre strength/Colour/Impurity/Moisture regain/Honey dew and cavitoma/Others/Assessment of each fibre property

c) Classing in factory

Description of deficient cotton/Grading/Classification and grade of cotton

4.2 Control of semi-finished goods and products per each process

1) Control points per each process

2) Control criteria

3) Production process control

4) Responsible personnel for control

5. Statistical Quality Control

5.1 Distribution

1) Standard deviation

a) Formula

b) Properties of standard deviation

c) Histogram

2) Distribution of mean value

3) Distribution of range (R)

5.2 Control chart

1) Control chart of $\bar{X}$ - R

2) How to draw up a control chart

3) How to understand a control chart

4) Description of control charts

5.3 Various distributions

1) t Distribution

2) F Distribution

5.4 Verification and presumption

1) Verification of mean value μ of population

C. Course for Each Process

1, Blowing Process

1.1 Outline of blowing process

1.2 Caution at cotton mixing

1.2 Construction and Action

1) Construction and action of each machine
Creeper lattice/Bale opener/Hopper bale breaker/Hopper mixer/Superior cleaner/Crighton opener/Porcupine opener/Hopper feeder/Shirley opener/Double beater lapper/Lap machine/Blending bale opener/Single beater opener/Two way distributor/Magnetic separator/Roving waste opener/Fan condenser

2) Arrangement of machinery

3) Automated apparatus of blowing machinery

1.3 Preventive maintenance

1) Periodical maintenance
3 months periodical maintenance/Lubrication/Cleaning

2) Function deterioration check

3) Small defect check

1.4 Cotton feeding adjusting apparatus

1) Piano motion

2) Photocell system

3) Feeling motion (Swing motion)

1.5 Quality control

1) Licking and splitting

2) Badly dust-removed lap (Dirty lap)

3) Lap with much twisted fibre

4) Deformed lap

5) Defective selvage lap

2. Carding Process

2.1 Outline of carding process

1) Object

2) Description of carding engines

3) Carding action

2.2 Construction and action of card

1) Construction of feeding part
Feedle back/Lap roller/Dish plate/Feed roller/Feed roller step/Weighting apparatus/Feed roller clearer

2) Taker-in part
Taker-in roller/Mote knife/Taker-in undercasing

3) Cylinder
Back sheet/Flat bar/Flat chain/Flexible bend/Front top sheet/Front bottom sheet/Steel (Stripping) door/Cylinder under casing/Flat cleaning device

4) Action of flat and cylinder
Gauge between flat and cylinder/Action of flat/Movement of flat/Action of cylinder

5) Doffer
Doffer/Doffer bend/Dandy lever/Doffer comb/Doffer dirt sheet/Trumpet plate/Coiler

6) Card clothing
Wire cloth/Metallic card clothing (MCC)/Comb blade

2.3 Process control

1) Gauge

2) Test and inspection
Examination of neps and foreign matters/Investigation of waste cotton/Sliver grain and grain variation

3) Hooked fibre

4) High speed operation and damage of fibre

5) Life of MCC and clothing grinding cycle

6) Defective quality and its cause
Unevenness of web/Defective selvedge web/Defective flat strip/Defective web/Others

2.4 Preventive maintenance

1) Periodical maintenance
Maintenance A/Maintenance B/Stripping of cylinder and doffer/Lubrication/Wire grinding/Cleaning by operatives

2) Function deterioration check

3) Small defect check

3. Combing Process

3.1 OUtline of combing process

1) Object

2) Main action

3) Arrangement of machinery

4) Description of comber

3.2 Construction and action
- 1) Sliver lap machine
- 2) Ribbon lap machine
- 3) Super lap former
- 4) Whitin J type comber

3.3 Waste cotton
- 1) Waste cotton ratio
- 2) Faults of waste cotton
- 3) Adjustment of waste cotton ratio
- 4) Investigation of waste cotton ratio

3.4 Prevention of faults of fleece

4. Drawing Process

4.1 Outline of drawing process
- 1) Object
- 2) Main action
  Doubling action/Drafting action/Coiling action

4.2 Construction of drawframe
- 1) Drafting mechanism
- 2) Features of high speed drawframe
- 3) Weighting system
- 4) Clearer
- 5) Coiler part
- 6) Stop motion

4.3 Operation control
- 1) Various calculations
  Gearing diagram/Revolution of each part/Turnout
- 2) Test and examination
  U %/Measuring of grain/Staple diagram
- 3) Diameter of reducer hole
- 4) Capacity of sliver can

4.4 Preventive maintenance
- 1) Maintenance A
- 2) Maintenance B
- 3) Daily maintenance and lubrication
- 4) Inspection and cleaning by operatives
- 5) Function deterioration check
- 6) Small defect check

5. Roving Process

5.1 Outline of roving process

1) Main action

Drafting action/Twisting action/Cop building and winding action

2) Description of roving frames

5.2 Construction and action of roving frames

1) Draft part

2) Weighting system

3) Clearer

4) Twisting and cop building motion mechanism

Twisting motion/Winding and building motion/Diferential motion/Swing motion

5) Stop motion

5.3 Process control

1) Number of layers

2) Winding change

3) Roving tension

4) Roller gauge, weight, draft distribution

5) Number of twist

5.4 Preventive maintenance

1) Maintenance A, B

2) Daily maintenance and lubrication

3) Check and cleaning by operatives

4) Function deterioration check

5) Small defect check

6. Ring Spinning Process

6.1 Outline of ring spinning process

6.2 Construction and action of ring frame

1) Feeding part (Creel part)

2) Drafting part

Draft and roller gauge/Roller stand/Roller weight/Bottom roller/Cradle/Trumpet/Apron band/Collector/Clearer

3) Twisting and taking up part

Ring/Traveller/Burning of traveller/Traveller clearer/Spindle/Tin roller, tin pulley/Bobbin/Thread guide/Tape tension device/Spindle tape/Anti-balooning device/Twist coefficient

4) Building motion
Taking up device/Ring rail motion/Cop build mechanism/
5) Appurtenance mechanism
Pneumatic clearer device/Blow cleaner (Suction blow cleaner)/Automatic speed changing device/Tin roller sudden stopping device/Auto doffer

6.3 Process control
1) Yarn faults
Fluffy yarn/Rubbed yarn/Loose twist yarn/Overtwisted yarn/Snarl/Irregular yarn/With fly/Slab/Piecing defect/ Kinky yarn

6.4 Preventive maintenance
1) Maintenance A,B
2) Daily maintenance and lubrication
3) Cleaning of roller part and cleaning by operatives
4) Function deterioration and small defect check

7. Winding Process

7.1 Outline of winding process
1) Object
2) Description
3) Description of traverse pattern

7.2 Construction and action of rotary traverse winder
1) Creel part
2) Tension device
3) Slub catcher
4) Drum
5) Package
6) Knot
7) Quality of package

7.3 Preventive maintenance
1) Maintenance A,B
2) Daily maintenance
3) Function deterioration check and small defect check

8. Preventive Maintenance of Weaving Process

8.1 Preventive maintenance of warper
1) Maintenance A,B

2) Lubrication A,B
3) Cleaning

8.2 Preventive maintenance of sizing machine
1) Maintenance A,B
2) Daily check
3) Lubrication A,B,C
4) Cleaning A,B

8.3 Preventive maintenance of Scharer pirn winder
1) Maintenance A,B,C
2) Lubrication
3) Cleaning A,B

8.4 Preventive maintenance of loom
1) Maintenance at loom running
2) Maintenance at loom downtime
3) Lubrication and cleaning

9. Quality Test and Control of Spinning Process

9.1 Raw material (Cotton)
1) Fibre length
2) Fibre strength
3) Fibre fineness
4) Moisture regain
5) Sugar content test

9.2 Blowing process
1) Weight control of one lap
2) CV % of grain per yard of lap
3) Trisection test of lap

9.3 Carding process
1) CV % of grain of card sliver
2) Waste cotton ratio
3) Investigation of neps and foreign matters of card web
4) Visual check of card web

9.4 Drawing process
1) Control of grain of sliver
2) U % of sliver

9.5 Roving process
1) CV % of mean grain per 30 yds of roving
2) U % of roving

3) Strength of roving
4) Number of breakage of roving

9.6 Ring spinning process
1) Percentage of deviation of yarn number count
2) Percentage of moisture regain
3) U % of spinning yarn
4) CV % of variation of yarn number count
5) IPI (thin, thick, neps)
6) Assessment of yarn evenness on board
7) Tensil strength of single yarn
8) Number of twist
9) Moisture regain
10) Number of roller twining, number of apron breakage
11) Number of end breakage (Measuring at one doffing)
12) Instantaneous end breakage number

9.7 Winding process
1) End breakage ratio
2) Number of faults of cheese yarn
3) Number of generation of defective cheese

9.8 Others
1) Generation quantity of yarn waste

Annex F

EXPENDITURE ON PROJECT EQUIPMENT

	Japanese Yen	U S Dollars	Contract Budget
Spinning Department			
Blowing Room	12,175,495		
Carding	15,979,790		
Existing Drawframes	16,854,940		
New Drawframes	20,800,000		
Spares and Sliver Cans	7,273,300		
Roving	40,918,472		
Ring Spinning Frames	16,331,152		
Murata RT Winding	11,136,473		
Auxiliary Equipment	10,130,920		
Measuring Gauges	1,084,800		
General Maintenance Tools	3,002,040		
Sub-total	155,687,382	662,500	56.4%
Laboratory Equipment	2,301,790	9,795	0.8%
Weaving Department			
BC Spooler	21,004,860		
BC Warper	2,996,000		
Existing WP Sizing	2,578,550		
New Baba Headstock	17,160,000		
Scharer Pirn Winding	11,263,780		
Looms	17,475,320		
General Maintenance Tools	2,500,290		
Sub-total	74,978,800	319,059	27.2%

N.B. Notional Exchange Rate U S $ 1 = 235 Japanese Yen

		U S Dollars	Contract Budget
Finishing Department			
Kyoto Roller Printing	13,437,430		
Morrison Bleaching Range	11,217,926		
King Kong Raising Machine	1,376,785		
Measuring Tools	183,220		
Sewing Machine Spares	563,489		
New Sewing Machines	846,000		
Maintenance Tools & Equipment	3,026,080		
Sub-total	30,650,930	130,430	11.1%
Utilities			
Electrical Installation	1,948,215		
Air Conditioning	837,960		
Steam Generation	2,648,690		
Sub-total	5,434,865	23,127	2.0%
Engineering Workshop			
Cutters, Materials, Tools	7,090,493	30,172	2.6%
Grand Total	276,144,260	1,175,082	100.0%
Project Vehicle		6,362	
Spares for Project Vehicle		1,000	
Training Equipment (Project Revision "F")		10,000	
22 Technical Reference Books		410	
Supplementary Budget (Project Revision "I")		100,000	

Annex G

PERFORMANCE TEST OF NEW TOYODA DRAWFRAMES

Date of test: 30 May 1984

Duration: 0905 to 1105 hours

Conditions: Temperature 35°C Relative Humidity 56%

Nature of Testing:

1. observation of running performance
2. machine production and running efficiency
3. linear density card sliver
4. linear density first passage sliver
5. linear density second passage sliver
6. sliver evenness U% (tested at Thang Loi Factory)

Persons present:

1. Machine Installer - E. Iwai, Toyoda
2. Team Leader - E. Watanabe, Toyobo
3. Chief Technical Adviser - T. M. Haworth, UNIDO

Drawframe Model: Toyoda DY2 Material: 100% cotton

1st passage 2 drawframes Machine Nos. 1097 and 1098

2nd passage 2 drawframes Machine Nos. 1099 and 1100

Drafting system: 4 over 3 with pressure bar

Delivery speed: 255 metres per minute

First passage:

creel for can size 406 mm x 1067 mm

supply can size - 1097 305 mm x 915 mm (Toyoda cards)

- 1098 400 mm x 915 mm (Howa cards)

8 ends fed 0.143 hank 4.13 grams per metre

delivered sliver 0.143 hank

Second passage:

creel for can size 406 mm x 1067 mm

supply can size - 1099 406 mm x 1067 mm

- 1100 406 mm x 1067 mm

8 ends fed 0.143 hank 4.13 grams per metre

delivered sliver 0.119 hank 4.96 grams per metre

can size for delivered sliver 406 mm x 1067 mm

creeled in Toyoda Roving Frame Type FAB

Preparation

Installation of the four drawframes commenced on 12 May and they were placed on newly prepared concrete foundations. Checking, adjusting, and running trials were carried out up to 29 May.

For testing purposes card sliver from reconditioned Toyoda cards was supplied to Drawframe No. 1097 and from standard Howa cards to Drawframe No. 1098. It was noted that the sliver produced by the Howa cards was characterised by a loosely formed cross-section and poor build-up inside the cans.

Creeling of sliver cans for each delivery of both second passage drawframes was arranged so that four cans were taken from each of the first passage deliveries.

Inspection

During the two hour test period the following events occurred:

0912	1097	coiler tube choke at can change
0925	1097	delivered sliver breakage
0925 - 1000	1100	no feed sliver
0940 - 0946	1099	no feed sliver
0953 - 0955	1097	trumpet choke
0955 - 0959	1097	piecing-up delivered sliver
1000 - 1009	1099	no feed sliver
1016 - 1020	1099	no feed sliver
1021 - 1025	1100	no feed sliver
1023 - 1031	1097	remove lap on 2nd bottom roller
1025 - 1031	1099	no feed sliver
1037 - 1048	1099	no feed sliver
1037 - 1055	1100	no feed sliver
1050 - 1054	1098	piecing-up delivered sliver

Meter Readings

Time	0905	0935	1005	1035	1105
Machine No.					
1097	2580	3160	3650	4218	4752
1098	30	579	1113	1643	2107
1099	980	1535	1813	2112	2410
1100	4180	4258	4458	5019	5117

Production and Efficiency

Period	0905/0935		0935/1005		1005/1035		1035/1105	
Machine No.	Length produced (yards)							
1097	5800	69%	4900	59%	5680	68%	5340	64%
1098	5490	66%	5340	64%	5300	63%	4640	56%
1099	5550	66%	2780	33%	2990	36%	2980	36%
1100	780	9%	2000	24%	5610	67%	980	12%

Test Results - grains per six yards sliver

(4 June 1984)

Machine No.	Morning Average	Afternoon Average	Overall Average	Heaviest	Lightest
1097 (1st)	346.1	326.4	336.3	361.6	319.3
1098 (1st)	331.5	330.7	331.1	355.9	317.5
1099 (2nd)	405.9	421.8	413.8	439.4	390.7
1100 (2nd)	415.6	407.9	411.7	423.6	396.8

Card Sliver weighings over ten days (grains)

Card No.	Average weight 10 x 6 yd lengths per day	Average of highest weight	Average of lowest weight	Average range
45	340.3	368.1	318.1	50.0
46	339.6	365.3	316.9	48.4
47	330.4	346.9	312.6	34.3
48	332.3	353.9	314.5	39.4

Coefficient of Variation within Card Sliver
(ten weighed lengths of six yards)

1. Reconditioned Toyoda cards prior to any reconditioning work in blowing section.
2. Weights (grains) of 10 consecutive six yard lengths tested on ten days (8 - 19 June 1984).

Day	#45	#46	#47	#48
1	5.56	3.34	3.95	3.89
2	4.26	2.86	3.53	-
3	5.21	4.99	3.22	3.13
4	5.89	6.60	3.68	3.56
5	5.66	4.87	1.91	4.34
6	4.13	3.42	2.38	2.06
7	2.86	3.38	3.62	-
8	5.33	4.13	3.68	3.37
9	4.10	5.56	3.09	4.58
10	7.67	4.09	3.58	3.46

Note: One yard of scutcher lap has a nominal weight of 14.3 ounces which is equivalent to 110 yards of card sliver.

Conclusion

This was the second attempt to carry out a performance test, the first having been prevented on the previous day by the lack of sufficient card sliver feed material and the state of preparations in the area of the four drawframes.

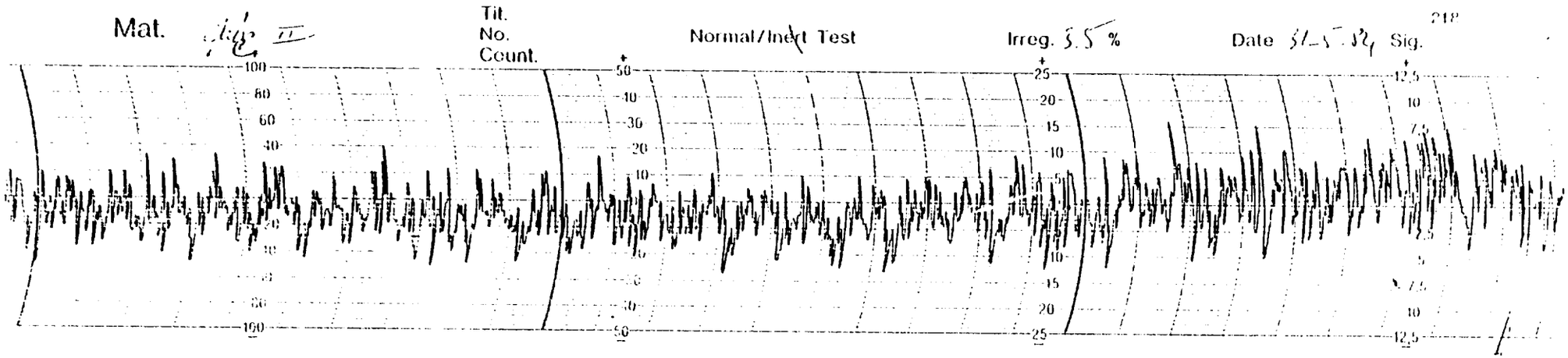
During the period of observation it was considered that the drawframes appeared to be running satisfactorily taking into account the condition of the feed material from the Howa cards for one set of drawframes and the brief experience of the operatives in running such machinery. It should be noted that the new drawframes are larger in size (especially in height) than any others in the factory and require more careful attention to somewhat more complex mechanisms.

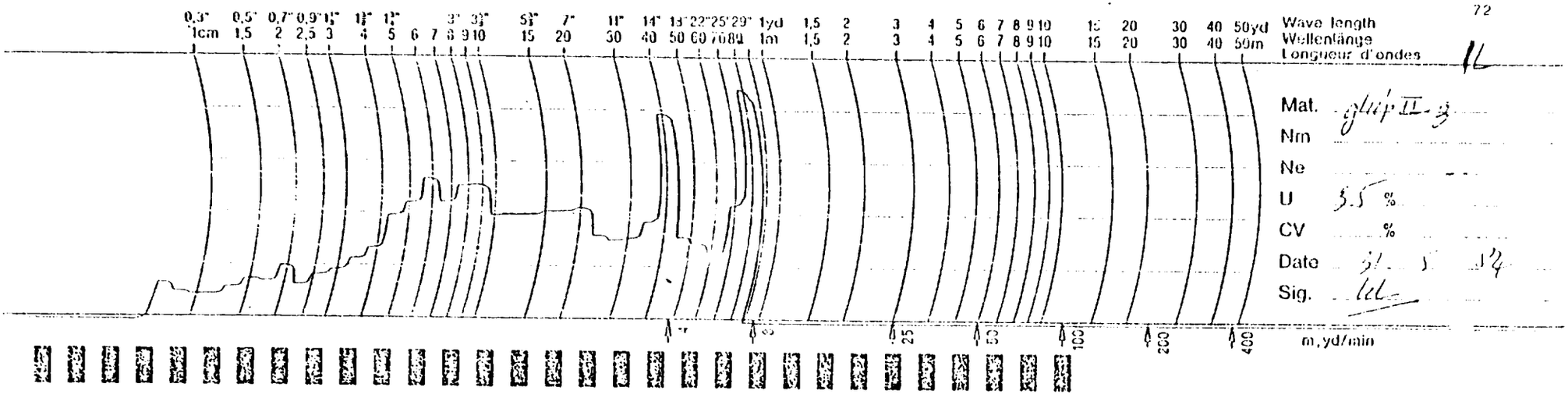
Sliver from all four drawframes was sent to Thang Loi Factory to enable testing to be performed on Uster evenness equipment. Three linear irregularity readings were obtained for sliver from each delivery on each drawframe resulting in the following averages:

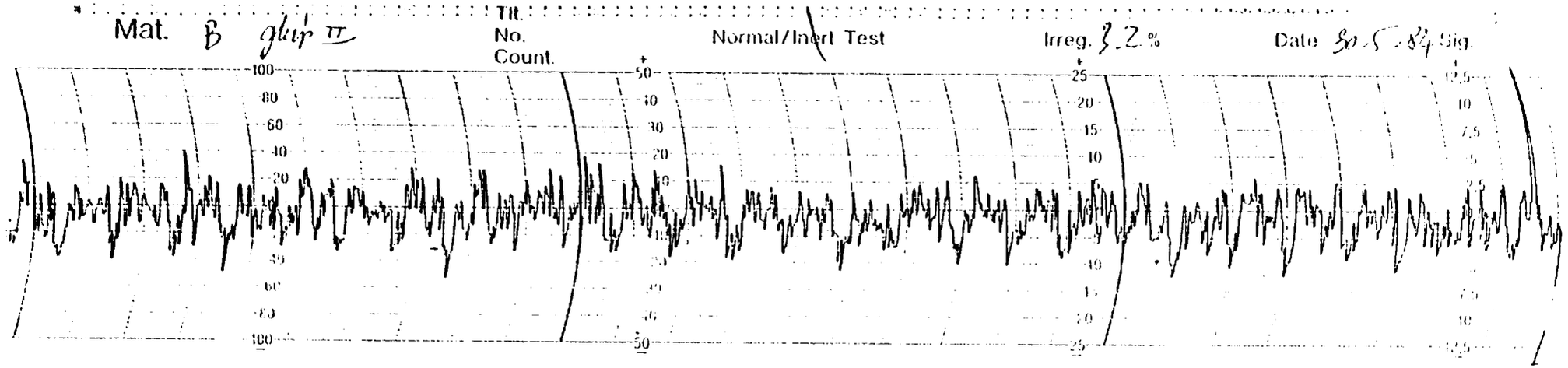
Uster U%	First Passage		Second Passage	
Machine Number	1097	1098	1099	1100
LH delivery	3.43	4.17	3.00	3.13
RH delivery	3.57	3.57	2.67	3.33

These figures compare favourably with the Uster Experience Values 1982 at the 50% level of 3.8 (1st passage) and 4.0 (2nd passage).

Following an examination of the Spectrograms it was clear that there was a pronounced periodic occurrence at the wavelengths of around 40 and 80 cms affecting each delivery and it was thought that it could result from the pattern of the sliver build-up in the sliver cans, i.e. "can effect". Therefore, a few days after the performance test another lot of sliver was prepared by allowing it to fall on to a tray from the coiler thus avoiding the compression resulting from the building pattern inside the can. After testing there was no evidence of the periodicity previously observed and it was considered that no gross machine fault was occurring and that all four drawframes were performing satisfactorily.

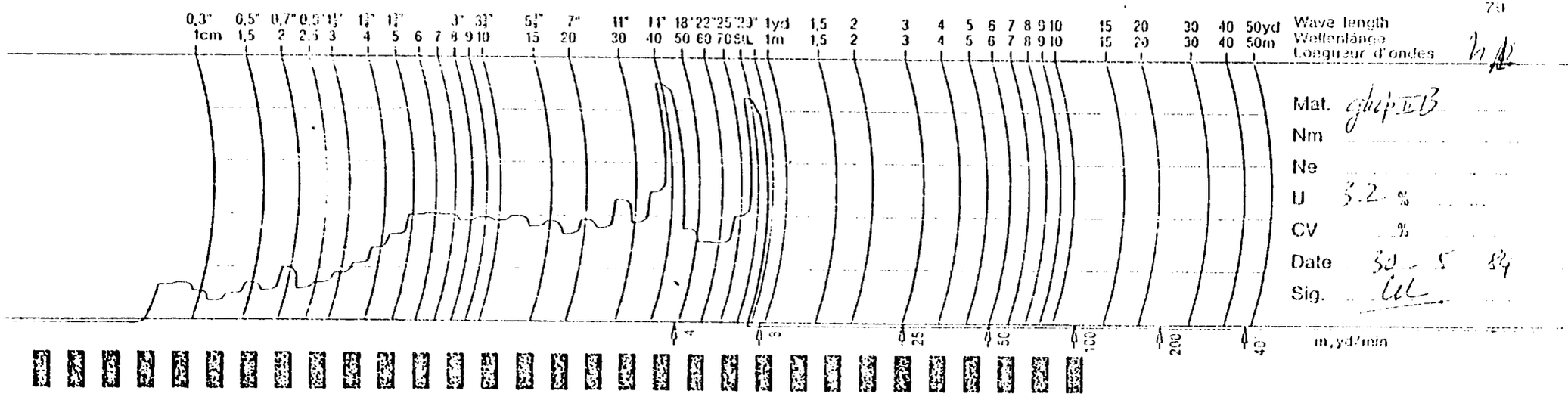

Mat. Grp II
Tit.
No.
Count.
Normal/Inert Test
Irreg. 5.5 %
Date 31.5.24
Sig.
Mat. 4, 8, 25, 50, 100, 200, 400 m/min
Diagram 2,5, 5, 10, 25, 50, 100 cm/min
Zellweger Uster AG
120 451 - 00021


Wave length
Wellenlänge
Longueur d'ondes
Mat. Grp II-3
Nm
Ne
U 5.5 %
CV %
Date 31.5.24
Sig.
m,yd/min
Zellweger Uster AG
120 451 - 00203



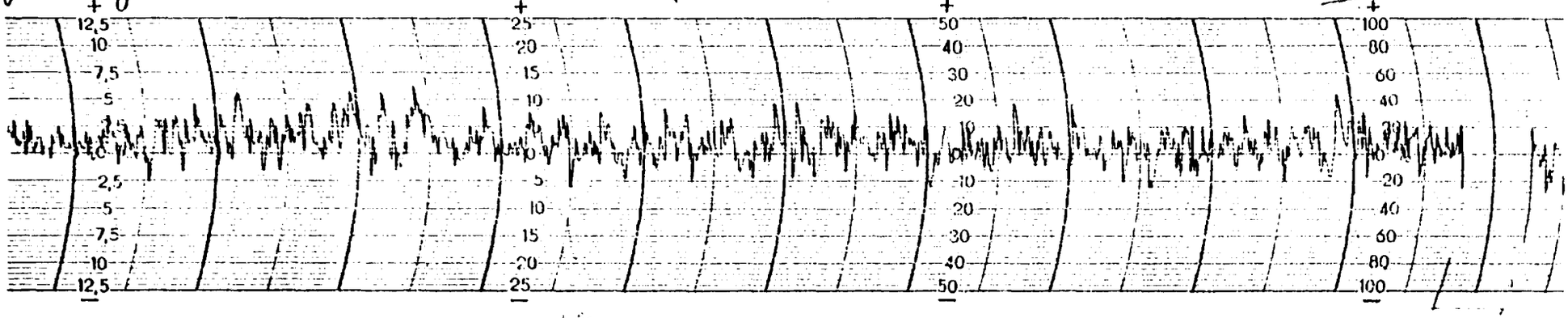
Mat. 4, 8, 25, 50, 100, 200, 400 m/min Diagram 2,5, 5, 10, 25, 50, 100 cm/min

Zellweger Uster AG 120 451 - 00021



Zellweger Uster AG 120 451 - 00 00

glúp băng II No. 2 - A Count. Normal/Inert Test Irreg: 2.5 % Date: 15-6-84 Sig: lul



18 Mat. 2, 4 [8] 25, 50, 100, 200 ~~yards~~m/min Diagramm 2" [4"] 10", 20", 40" /min

Modèle déposé Zellweger Ltd. Uster

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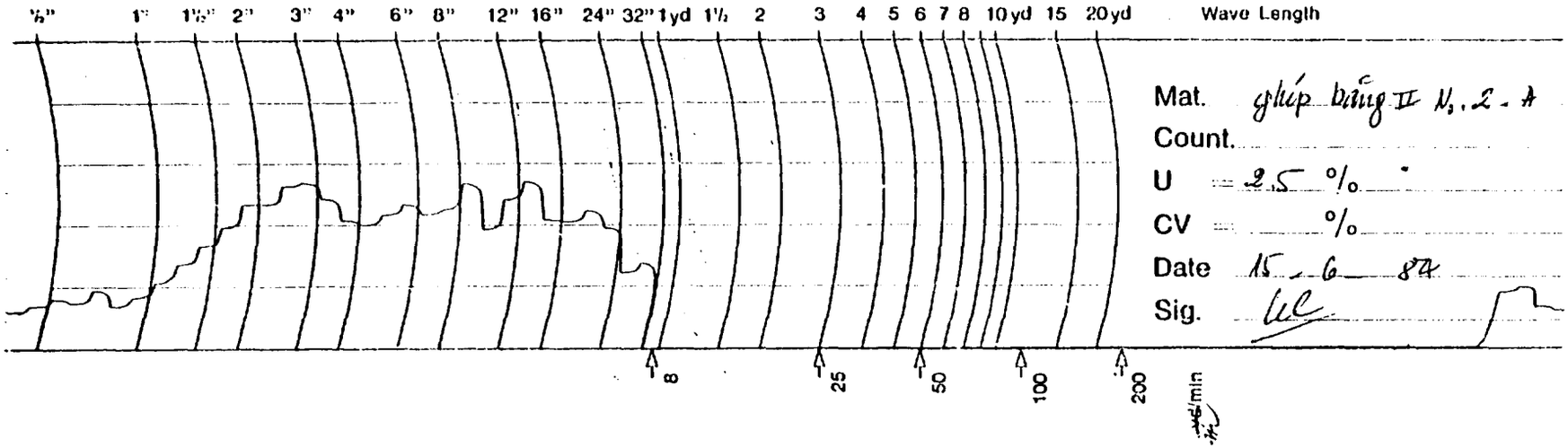
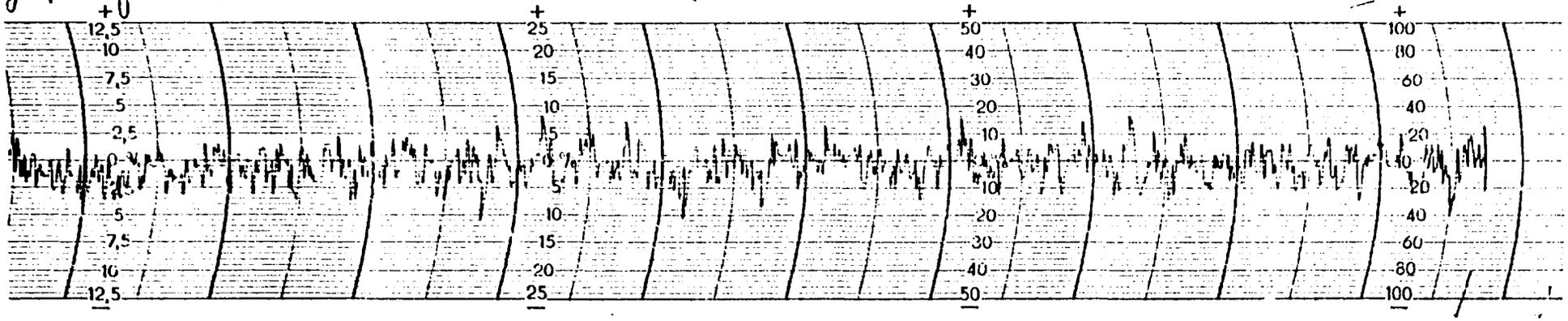


Mat. glúp băng II No. 2 - A
Count.
U = 2.5 %
CV = %
Date 15 - 6 - 84
Sig. lul

Modèle déposé Zellweger Ltd. Uster

ghép băng II No. 2-B Count. Normal/Inert Test Irreg: 2.4 % Date: 15-6-84 Sig: lel



24

Mat. 2,4 8 25,50,100,200 m/min Diagramm 2" 4" 10",20",40" /min

Modèle déposé Zellweger Ltd. Uster

96

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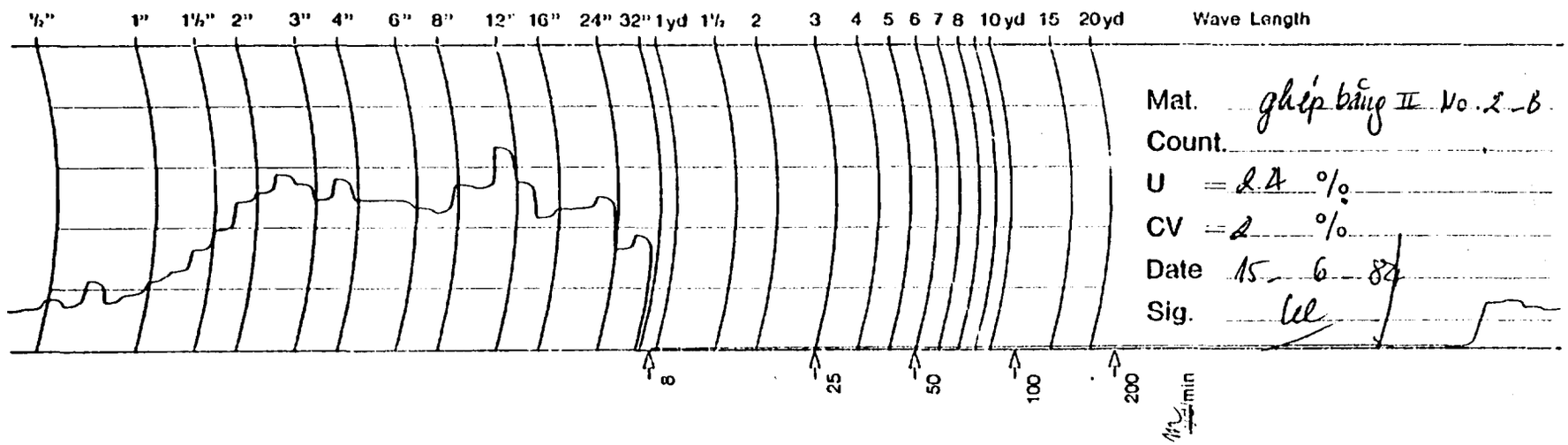


Modèle déposé Zellweger Ltd. Uster

Annex H

PERFORMANCE TEST OF NEW BABA SANGYO SIZING HEADSTOCK

Reconditioning of the existing West Point Sizing Machine No.1 (dating from around 1960) was to be carried out by removing the loom beam winding headstock and replacing it by a complete new section, which would then be connected up to the existing drying section.

Following the arrival at the factory on 11 May 1984 of the machine installer the packing cases containing the new Baba Sangyo Headstock were opened and a pit to take the press roll mechanism and the pneumatic beam doffing mechanism was prepared.

The main parts of the existing machine were mostly overhauled or repaired although a few new replacement parts were available and put into use. The new headstock was assembled in a few days and the work of co-ordinating the operation of the new and existing control mechanisms was carried out. In addition, new connections were made to the electrical and compressed air installations.

Adequate running trials to test the various mechanisms were made and a set of Ne 20s warp yarn beams were creeled for the performance test carried out for one hour on 29 May in the presence of the Toyobo Team Leader, the Machine Installer, and the UNIDO Chief Technical Adviser.

Set of Warpers Beams prepared on the BC Warper
4 beams x 389 ends plus 1 beam x 388 ends
Total Ends 1,944 Total Length 26,000 m

Running Speed	50 metres per minute
Winding Tension	1.05 kg/sq. cm.
Press Roll Pressure	2.00 kg/sq. cm.
Amps	10
Steam Pressure	3.5 kg/sq. cm.
Air Pressure	6.3 kg/sq. cm.
Draft on Yarn Sheet	1%
Warp Weight	61 gm per running metre

During the observation period the sizing machine functioned without mishap. The sizing and drying of yarn and the formation of beams for the looms at an appropriate and steady tension was carried out satisfactorily. All functions as recorded on the Test Checksheet were observed to be performing as expected.

A cloth covering, which had been wound on to the drawroller with a thick seam and was causing the whole assembly to vibrate at each revolution, was arranged to be replaced. Later it was noted that the assembly was functioning satisfactorily as a result of the change.

Annex I

PROJECT DOCUMENTATION

1. Engineering Survey Report for the Reconditioning of Viet Thang Factory at Ho Chi Minh City, Vietnam

Prepared by Toyoda Automatic Loom Works Ltd, Aichi, Japan

February 1983

- an outline of the condition of machinery in the departments of spinning, yarn preparation, weaving, and finishing
- a detailed list of the spare parts needed to restore selected machines to a minimum operating standard
- items of maintenance and other new equipment required to meet a minimum operating standard
- an estimate of the time, labour force, and supervisory personnel required to complete the reconditioning work in the shortest possible time.

2. Proposal for the Improvement of Maintenance Procedures and Production Management Practices in Selected Textile Factories in the south of Vietnam

Prepared by C. Itoh & Co. Ltd, Tokyo, Japan

March 1983

3. Revised Proposal for the Improvement of Maintenance Procedures and Production Management Practices in Selected Textile Factories in the south of Vietnam

Prepared by C. Itoh & Co. Ltd, Tokyo, Japan

June 1983

- composition of the technical team needed to supervise machinery reconditioning and carry out an On-the-Job Training Programme
- outline of the Training Programme

- details of the arrangements in Japan for a Study Tour to enable production and maintenance staff to investigate effective management practices

- revised list of spare parts and equipment

4. Contract No. 83/33 dated November 1983 between the United Nations Industrial Development Organization and C. Itoh & Co. Ltd, Japan including the Final List of Selected Parts, Accessories, Machines, and Equipment to be supplied by the Contractor.

5. Documents for the establishment and implementation of the System of Preventive Maintenance at Viet Thang Factory for each of the following machine sections:

Spinning
- Toyoda Blowing Line
- Toyoda Cards
- Toyoda Drawframes
- New Drawframes
- Toyoda Roving Frames
- Toyoda Ring Spinning Frames
- Murata Rotary Traverse Winding Frames

Yarn Preparation
- BC Spooling
- Warping
- Sizing
- Scharer Pirn Winding

Weaving
- Toyoda Looms

6. An Assessment of Machine Condition and Processing Practices at Thang Loi and Dong Nam Factories and a Revised Work Programme to improve the Standard of Maintenance Work.

Toyobo Engineering Co. Ltd

June 1984

Annex J

ORGANIZATION FOR IMPLEMENTATION
OF PREVENTIVE MAINTENANCE SCHEME

The preventive maintenance scheme in Viet Thang Factory is operated by vertical organization involving technical staffs from Technical Deputy Director till each maintenance technician. It can be summerized in attached organization chart.

The flow of order giving, report and feedback, and monitoring throughout the organization can be epitomized as follows.

Technical Deputy Director ←(5)→ Technical Deputy Head ←(4)→ Group Leader ←(3)→ Group Workers

(6) (1) (2)

1) Technical Deputy Heads of Spinning 1 and Weaving 1 who are virtually responsible for the implementation of Preventive Maintenance System (PMS) shall draw up a Monthly Programme indicating each maintenance item planned during one month in terms of each group or section, in accordance with the established maintenance procedure, and after getting approval of the Technical Deputy Director shall hand it to group leaders as instruction sheet at latest ten days before the beginning of the month.

2) The group leader (or sub-leader in case of absence of the leader) of 5 groups of Spinning 1, 2 groups of Weaving 1 and 1 group of Spinning 2 shall allocate every day ordered works to each group workers in compliance with activities specified in aforesaid programme. This instruction is made by means of Job Instruction Card specifying the job for technicians to do. The leader must prepare beforehand necessary number of job card to be handed to workers. This work order is desirable to be given at latest on the previous day of implementation day.

3) Worker technicians assigned for an activity of maintenance must do their job as specified in the card and every time

an ordered work is completed, he shall return it to the group leader within the day of designated work in token of confirmation of fulfilment of assigned job after filling out necessary issues in the card.

4) The leader collects such job cards after completion of allocated job and he shall fill out Check Sheet of various maintenance activities on the basis of both returned job cards and his own check on the scene. In the meantime he shall make a Daily Report for reporting purpose to Technical Deputy Director and shall hand it to him immedeately after completing of planned daily activities.

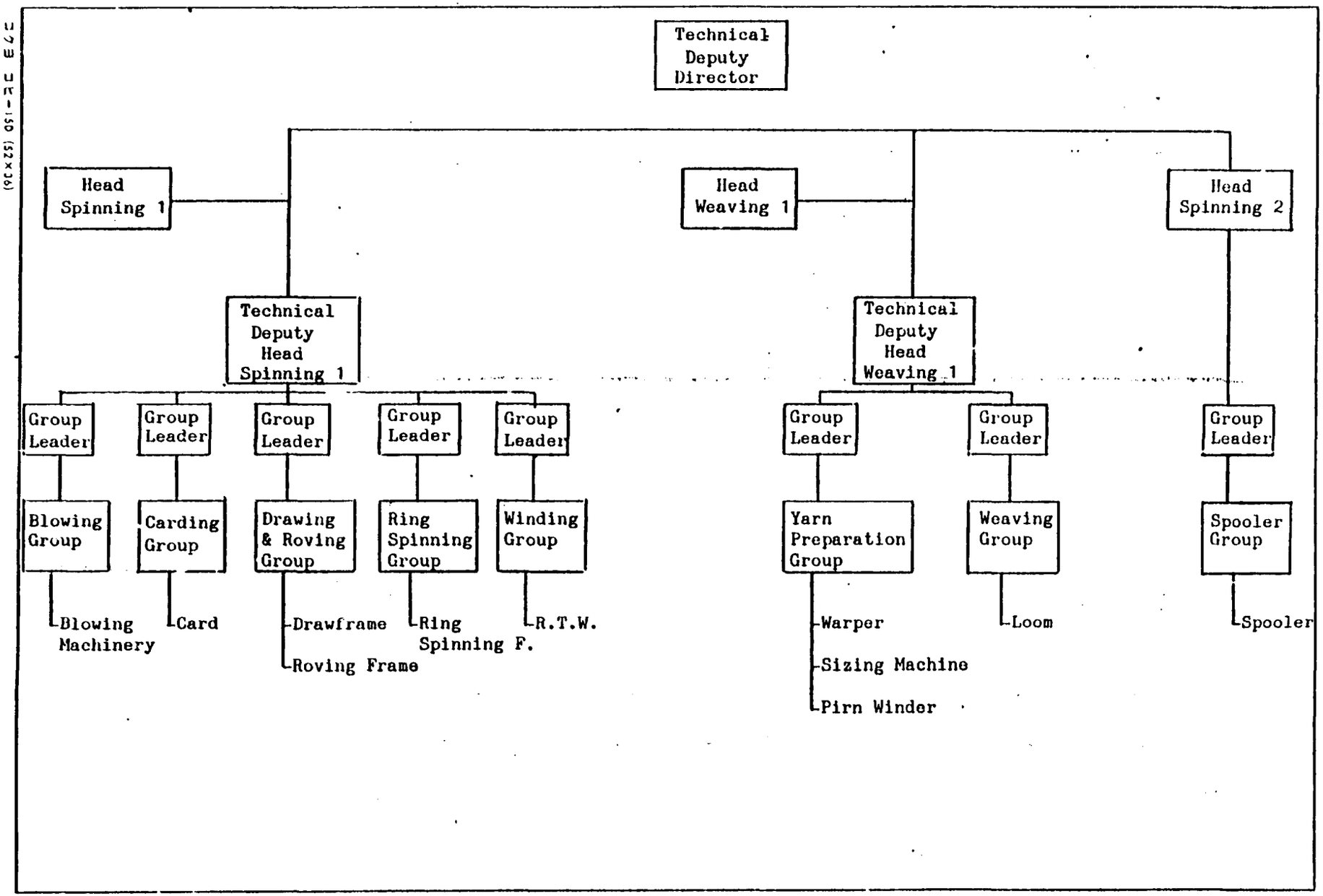
5) Technical Deputy Head shall prepare in his turn Weekly Report for the reporting purpose to the Technical Deputy Director, summerizing progress of preventive maintenance scheme, important incidents which took place and necessary modification of the scheme, etc. and attaching as the case may be, daily reports received from Group Leaders. He shall transmit weekly report to his superior at every monday following the week.

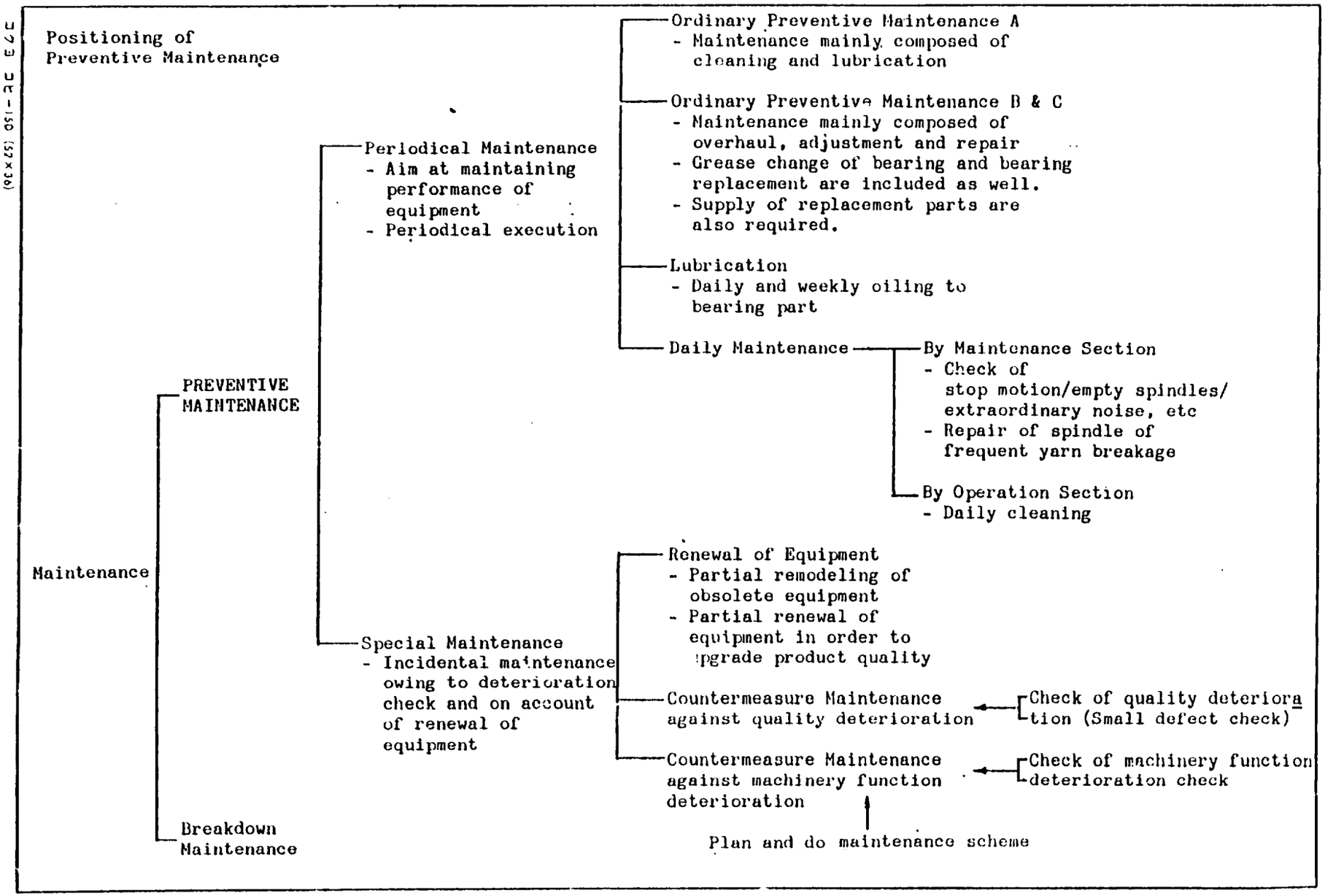
6) Technical Deputy Director checks and monitors the implementation results of preventive maintenance scheme in accordance with the report by Technical Deputy Heads and with meetings with them to be held from time to time.

Note.-

Underlined forms are attached herewith and compiled in the Manual for Implementation of PMS.

ORGANIZATION CHART FOR PREVENTIVE MAINTENANCE SCHEME




Positioning of
Preventive Maintenance
Maintenance
PREVENTIVE
MAINTENANCE
Breakdown
Maintenance
Periodical Maintenance
- Aim at maintaining performance of equipment
- Periodical execution
Special Maintenance
- Incidental maintenance owing to deterioration check and on account of renewal of equipment
Ordinary Preventive Maintenance A
- Maintenance mainly composed of cleaning and lubrication
Ordinary Preventive Maintenance B & C
- Maintenance mainly composed of overhaul, adjustment and repair
- Grease change of bearing and bearing replacement are included as well.
- Supply of replacement parts are also required.
Lubrication
- Daily and weekly oiling to bearing part
Daily Maintenance
By Maintenance Section
- Check of stop motion/empty spindles/ extraordinary noise, etc
- Repair of spindle of frequent yarn breakage
By Operation Section
- Daily cleaning
Renewal of Equipment
- Partial remodeling of obsolete equipment
- Partial renewal of equipment in order to upgrade product quality
Countermeasure Maintenance against quality deterioration
Check of quality deterioration (Small defect check)
Countermeasure Maintenance against machinery function deterioration
Check of machinery function deterioration check
Plan and do maintenance scheme

JOB DESCRIPTION OF KEY PERSONNEL

1. Worker technician
   1) To carry out assigned maintenance work on the basis of given job card
   2) To be obliged to report the completion of assigned work and return the job card duly filled up and signed by him to his leader immediately after the completion of the work
   3) To report to his leader his findings relating to necessity of replacement and/or repair of parts in the course of fulfilment of his assigned work.

2. Group Leader & Sub-leader
   * Definition of sub-leader
   He shall substitute leader at absence of the latter.
   He shall work under command of his leader as other workers but be expected to give relevant assistance and advice to the leader.
   1) To assign each maintenance work ordered by the deputy head to each of his worker technicians, taking account of time and personnel required for the implementation of assigned work. The order is shown by the presentation of each job card to each member worker. For such purpose, he shall prepare beforehand necessary number of job cards.
   2) To collect each job card from his personnel and record outcomes of each activity carried out in the check sheet in terms of each maintenance items.
   3) To make daily report to the Deputy head regarding the progress of preventive maintenance.
   4) To be obliged to make necessary contact with the Production department to as to ensure beforehand no hitch impeding the implementation of maintenance activities.
   5) To be obliged to hand tools required for each activity to workers and to withdraw them at the beginning and end of every day.
   6) To be responsible for store of maintenance tools

7) To be obliged to make daily report to his deputy head as regards the result of ordered work by means of prescribed report form.
8) After being reported by workers of necessity of replacement and/or repair of parts, he shall make necessary decision about what to do and be in charge of making claim note for supply of new parts and/or for repair at the workshop and shall pass that note to the Deputy head.
9) To give relevant advice and assistance from time to time to the job of his workers, working together with them, except when he is engaged in his own assigned work.

3. Technical Deputy Head of Spinning 1 & Weaving 1

1) To draw up monthly programme for PMS in terms of each section and transfer it to each group leader for the implementation of all activities involved there at latest 10 days before starting first day of the month.
2) He shall hand one copy of monthly programme to Head of production department so as to get prior consent of the production department to stoppage of machinery required for planned activities. Such coordination should be finalized before fist day of the programme.
3) To check daily outcome of each activity , in accordance with daily report submitted by leader of each section.
4) To control and take necessary action for satisfactory implementation of PMS. He shall grasp ongoing situation and get rid of any obstacle to smooth implementation of PMS, trying as much as possible to inspect the spot of activities.
5) He shall deal without delay with claim note for new parts and repair requested by each leader and be responsible for arrangement for readiness of these in time.

6) Prior to drawing up a monthly programme, he shall listen to Technical Deputy Director for special policy or notes to take, if any, and he has to get approval of Technical Deputy Director about drawn up monthly programme.

7) He shall submit weekly report to Technical Deputy Director on every monday, attaching progress report utilizing copy of monthly programme painted by respective marking colour in column of each machine. He must inform immediately modification of plan and implementation of PMS in an unavoidable case to Technical Deputy Director.

4. Technical Deputy Director

1) He shall check monthly programme submitted by Technical Deputy Head by 20th every month and approve it adding necessary opinion and instructing to the latter an assured implementation of the programme.

2) He shall check weekly report submitted by Technical Deputy Head on every monday and return it without delay to the Deputy Head, after confirming the situation of planning and implementation of PMS.

3) He shall from time to time contact his staffs involved in the scheme so as to monitor the smooth implementation of preventive maintenance.

WEEKLY REPORT (PREVENTIVE MAINTENANCE SCHEME)

Reference No.
To: Technical Deputy Director
From: Technical Deputy Head of Spinning 1

1. General Situation of Preventive Maintenance

Section (Group)	Main activities carried out	Number of Absentee	Deputy Head's assessment on the work	Detected defects and breakdown of high frequency	Supply condition of new parts	Shortfalling spare parts	Problems for implementation of PMS
Blowing Machinery							
Card							
Drawframe							
Roving Frame							
Ring S. Frame							
Winder							

2. Other Special Notes

3. Circulation

Head of Spinning 1		Production Deputy Head	

WEEKLY REPORT (PREVENTIVE MAINTENANCE SCHEME)

Reference No. From To , 1984

To: Technical Deputy Director

From: Technical Deputy Head of Weaving 1

1. General Condition of Preventive Maintenance

Section	Main activities carried out	Number of Absentee	Deputy Head's assessment for the work	Detected Breakdown (High frequency breakdown)	Supply condition of new parts	Shortfalling spare parts	Problems for implementatio for PMS
Warper							
Sizing Machine							
Firn Winder							
Loom							

2. Special Notes

3. Circulation

Head of Weaving 1		Production Deputy Head of Weaving 1	

DAILY REPORT
(Preventive Maintenance Scheme)

To: Technical Deputy Head of Spinning 1
From: Carding Group Leader
Date:

1. Implementing Situation of Maintenance Activities

Description of Maintenance	Frame No. & Name	Date Started	Date Finished	Assigned Workers Name	Absence
Ordinary Maintenance A					
Ordinary Maintenance B					
Daily Maintenance					
Stripping of Cylinder and Doffer					
Lubrication A					
Lubrication B					
Grinding of MCC of Cylinder					
Grinding of MCC of Doffer					
Grinding of Flat Wire					
Maintenance of Flat Grinding Machine					
Maintenance of Flat Clipping Machine					
Maintenance of Wire Mounting Machine					
Maintenance of Auxiliary Equipment (Bare surface Grinder, Horse roller, Long roller					

2. Special Notes
   1) Detail of replaced and/or repaired parts

   2) Detected defects or breakdown

   3) Supply condition of spare parts and shortage

   4) Resulted downtime of machinery due to maintenance activity

   5) Problems hindering implementation of preventive maintenance and any other notes

3. Circulation As Needed

D A I L Y R E P O R T

(Preventive Maintenance Scheme)

To.: Technical Deputy Head of Weaving 1

From: Yarn Preparation Group Leader

Date:

1. Implementing Situation of Maintenance Activities

	Description of Maintenance	Date Started	Date Finished	Assigned Workers	Absence
Warper	Ordinary Maintenance A				
	Ordinary Maintenance B				
	Lubrication A				
	Lubrication B				
Sizing Machine	Ordinary Maintenance A				
	Ordinary Maintenance B				
	Daily Check				
	Lubrication A				
	Lubrication B				
	Lubrication C				
	Cleaning A				
	Cleaning B				
Pirn Winder	Ordinary Maintenance A				
	Ordinary Maintenance B				
	Ordinary Maintenance C				
	Lubrication				
	Cleaning A				
	Cleaning B				

2. Special Notes:

3. Circulation As Needed

DAILY REPORT
(Preventive Maintenance Scheme)

To.: Technical Deputy Head of Weaving 1
From: Weaving Group Leader
Date:

1. Implementing Situation of Maintenance Activities for LOOM

Description of Maintenance	Date Started	Date Finished	Assigned Workers	Group	Absence
Maintenance at Loom Running				A	
				B	
				C	
Maintenance at Loom Downtime				D	
				D	
				D	
				E	
				E	
				E	
Lubrication/1 day				1	
				2	
				3	
				4	
				5	
Lubrication/2 days				1	
				2	
				3	
				4	
				5	
Lubrication/3 days				1	
				2	
				3	
				4	
				5	
Lubrication/1 week				1	
				2	
				3	
				4	
				5	
Daily Cleaning				U	
				V	
				W	
				X	
				Y	
				Z	

2. Special Notes

3. Circulation As Needed

Annex K

EXAMPLE OF PREVENTIVE MAINTENANCE SYSTEM
FOR A MACHINE SECTION - RING SPINNING FRAMES

1. Machinery to Be Objective of Preventive Maintenance
   38 sets of TOYODA RF type (No.3,5,7 to 42)
2. Preventive Maintenance to Be Established
   Preventive maintenance for the ring spinning frame can be broken down into:
   1) Ordinary preventive maintenance A
   2) Ordinary preventive maintenance B
   3) Daily maintenance
   4) Lubrication A,B,C,D
   5) Machine cleaning
   6) Daily cleaning
   7) Checking on deterioration of machinery function and countermeasure maintenance
   8) Checking on deterioration of output quality and countermeasure maintenance
3. Standard Frequency and Necessary Staffs

Kind of maintenance	Frequency	Time required	Interval	Group	Technicians	
					Skilled	Semi-S
Ordinary preventive maintenance A	1 month	1 day/ 2 frames	2 frames/ 1 day	1	3	4
Ordinary preventive maintenance B	6 months	1 day/ 1 frame	1 frame/ 5 days	1	2	3
Daily maintenance	1 day	30 min/ 1 frame	12 frames/ 1 day	3	3	0
Lubrication A	1 day	10 min/ 1 frame	38 frames/ 1 day	1	0	1
Lubrication B	1 week	20 min/ 1 frame	19 frames 1 day	2	0	2
Lubrication C	6 months	1 hour/ 1 frame	38 frames 1 week	1	0	1
Lubrication D	1 year	1 hour/ 1 frame	38 frames 1 week	1	0	1
Machine cleaning	3 days	20 min/ 1 frame	12 frames/ 1 day	1	0	1
Daily cleaning	1 day				Each operative	

Kind of maintenance	Frequency	Time required	Interval	Group	Technicians	
					Skilled	Semi-S
Checking on deterioration	6 months	1 day 1 frame	1 frame/ 6 months	1	1	0

4. Equipments and Tools to Be Required
   This is specified in attached sheet.
5. Description of Maintenance to Be Carried Out
   This is specified in attached sheet.
6. Forms to Be Required
   1) Check and record sheet for each process
      Check and record sheets for following maintenance works are attached.
      - Ordinary preventive maintenance A
      - Ordinary preventive maintenance B
      - Lubrication A
      - Lubrication B
      - Lubrication C
      - Lubrication D
      - Daily maintenance
      - Checking on deterioration of machinery function (Function examination table)
      - Checking on deterioration of output quality (Small defects examination table)

   2) Daily maintenance report
      This form is used to report to the management the results of maintenance practice which takes place every moment.

   3) Machinery record
      Any special maintenance such as partial remodeling or renewing of machinery shall be recorded in this form. An example of the form is attached.
7. Implementation Scheme for Preventive Maintenance
   This is given in attached sheet.

TOYOBO FUNCTION EXAMINATION TABLE FOR RING SPINNING FRAME

CHECKING ON DETERIORATION OF MACHINERY FUNCTION

Factory : _____

Date : _____day_____month, _____year

item No.	function to be examined	points per 10,000 spindles	(A) points to be deducted per defect	unit for which defect is to be counted	(B) machine identification									(C) total No. of spindles examined	(D) total No. of defects	(E) No. of defects per 10,000 spindles	(F) deducts per 10,000 spindles	(G) points per 10,000 spindles	(H) improvement since previous
					No	No	No	No	No	No	No	No	No						
1	straightness of bottom roller	100	4	staff															
2	parallel. of top apron	80	0.5	set															
3	movement of apron	80	3	apron															
4	weighting for front roller	50	5	long weight															
5	setting of pneuma-flute	60	0.1	staff															
6	suction at pneuma-flute	40	0.5	staff															
7	height of lappet	40	0.2	lappet															
8	gauge of traveller clearer	20	0.05	clearer															
9	level of spindle rail	50	5	span															
10	spindle gauge setting	60	1	spindle															
11	function of latch hook	30	1	spindle															
12	tape tension	40	0.5	4 spindles															
13	upright of lifting pillar	60	2	pillar															
14	height of winding bottom	40	5	frame															
15	shape of full cop	30	5	frame															
16	wear of capper neck	40	5	frame															
17	bottom roller gauge	40	10	side															
18	setting of gearing	50	10	side															
19	vibration of frame	40	10	frame															
20	condition of bearing	50	2	bearing															
	total	1,000																	

TOYOBO SMALL DEFECT EXAMINATION TABLE FOR RING SPINNING FRAME

(MAINTENANCE)

CHECKING ON DETERIORATION OF OUTPUT QUALITY

Factory : _____

Date : _____day_____month, _____year

item No.	item to be examined	standard of judgement	points to be deducted per defect	number of defect per machine										number of machines examined	total number of defects	defects per 10,000 spindles	deducts per 10,000 spindles
				No	No	No	No	No	No	No	No	No	No				
1	up & down of ring rail	smoothness	10/frame														
2	ring setting	tightness, proper setting	2/ring														
3	tension of yarn being spun	too strong or too weak	2/ring														
4	setting of front under clearer	rotation, parallel setting	3/clearer														
5	setting of back under clearer	rotation, paraller setting	1/clearer														
6	gauge of snail wire	position of balooning	1/snail wire														
7	jockey pulley bracket	smoothness of movement	3/pulley														
8	skewer bracket & step, hole	setting position, loss, breakage	2/skewer														
9	idle spindle	due to improper maintenance	5/spindle														
10	bobbin vibration & setting	vibration, height ±3mm	1/bobbin														
11	shape of full bobbin	shape difference between frames	10/frame														
12	setting of pneuma-flute	difference : 2mm	2/flute														
13	setting of anti-node ring	centering, height	1/spindle														
14	oil quantity in spindle	heat of spindle bolster	3/spindle														
15	separator setting	tightness, distance	1/separator														
16	lappet	smooth movement	1/lappet														
17	spindle tape	damage of selvage	2/tape														
18	greasing to front roller neck	heat of roller neck	3/neck														
19	rubber socket for pneuma	breakage of socket at connection	2/socket														
20	traverse position, trumpet	centerig	10/side														
	total																

TOYOBO SMALL DEFECT EXAMINATION TABLE FOR RING SPINNING FRAME

(OPERATION)

Factory : _____

Date : ____day____month, ____year

item No.	item to be examined	standard of judgement	points to be deducted per defect	number of defect per machine										number of machines examined	total number of defects	defects per 10,000 spindles	deducts per 10,000 spindles
				No	No	No	No	No	No	No	No	No	No				
1	fiber wrapping on apron		5/apron														
2	collector	fleece out of position, movement	3/spindle														
3	trumpet hole	choking by fly, etc.	5/trumpet														
4	skewer step	smooth rotation	3/skewer														
5	clearer	stopping of rotation, damage of cloth, etc.	2/clearer														
6	surface of rubber cot	hollow, crack, oiling, vibration	2/spindle														
7	top roller arbor	oiling, smooth rotation	2/set														
8	belt tension	length, piecing	5/frame														
9	surface of apron	crack, selvage condition, piecing	3/apron														
10	bottom roller	fiber wrapping	5/spindle														
11	path of roving		3/spindle														
12	spindle tape	twisting, damaged	5/tape														
13	bobbin setting	more than 5mm high	1/bobbin														
14	cradle setting	setting of cradle spring and leg	5/cradle														
15	flat bar	contact with roving due to higher setting position	2/bar														
16	fiber wrapping on roving rod	damage to roving	2/wrapping														
17	wrapping of roving on roller neck	front roller neck	1/wrapping														
	total																

RING SPINNING FRAME

Classification of Maintenance	Frequency	Items to be carried out
Ordinary Preventive Maintenance A (by 7 persons/day/2 sets)	Once a month	1. Disassembling, cleaning, inspection and lubrication of roller gearing parts 2. Disassembling, cleaning, inspection and lubrication of gearing parts and belts 3. Disassembling, cleaning, inspection and lubrication of traverse motion and cap bar parts 4. Adjustment of height of ring rail 5. Cleaning, inspection and adjustment of ring rail, lappet bar and lifting motion 6. Cleaning of each clearer roller 7. Disassembling, cleaning, inspection and lubrication of top roller, cradle and tenser bar 8. Cleaning, inspection and lubrication of bottom roller parts 9. Cleaning of top board, roller beam and lappet parts 10. Cleaning of ring rail- lifting pillar and poker bush 11. Cleaning of spindle parts 12. Cleaning of tin roller and jockey pulley
Ordinary Preventive Maintenance B (by 5 persons/day/set)	Once every 6 months	1. Ordinary preventive maintenance A 1 to 12 2. Check and adjustment of verticality of lifting pillar 3. Setting adjustment of spindle, snail wire and antinode ring 4. Check and adjustment of flute and gum socket of pneuma duct 5. Check and adjustment of traveller clearer gauge 6. Check and adjustment of eccentric revolution of bottom roller 7. Check and adjustment of jockey pulley 8. Disassembling, cleaning, check and greasing of tin roller bearing 9. Adjustment of traverse motion 10. Check and adjustment of spindle tape 11. Supplementing of spindle oil 12. Magnetizing of magnet roller
Lubrication	Once a day	1. Roller gearing parts 2. Gearing parts
	Once a week	1. Lifting lever and heart cam parts 2. Traverse motion parts

Classification of Maintenance	Frequency	Items to be carried out
	Once every 6 months Once a year	1. Lubrication of upright pin 2. Supplementing of spindle oil 3. Greasing of jockey pulley bearing 2. Greasing of rocking shaft bracket 3. Greasing of tin roller bearing 4. Lubrication of rocking shaft ball

Cleaning by Operator

Hour	A	B	C	D	E	F
0.00						
1.00					x	
2.00			x			x
		x				
3.00					x	
4.00	x					
				x		x
5.00					x	
6.00			x			
		x				
7.00					x	x
8.00						

Cleaning on Doffing Operator

A	B	C	D
	x		
x		x	
			x
	x		
			x
x		x	

Note.- Cleaning by Operator
A. Roving rail
B. Roller beam
C. Top board
D. Spindle parts
E. Floor between machines
F. Lappet bar

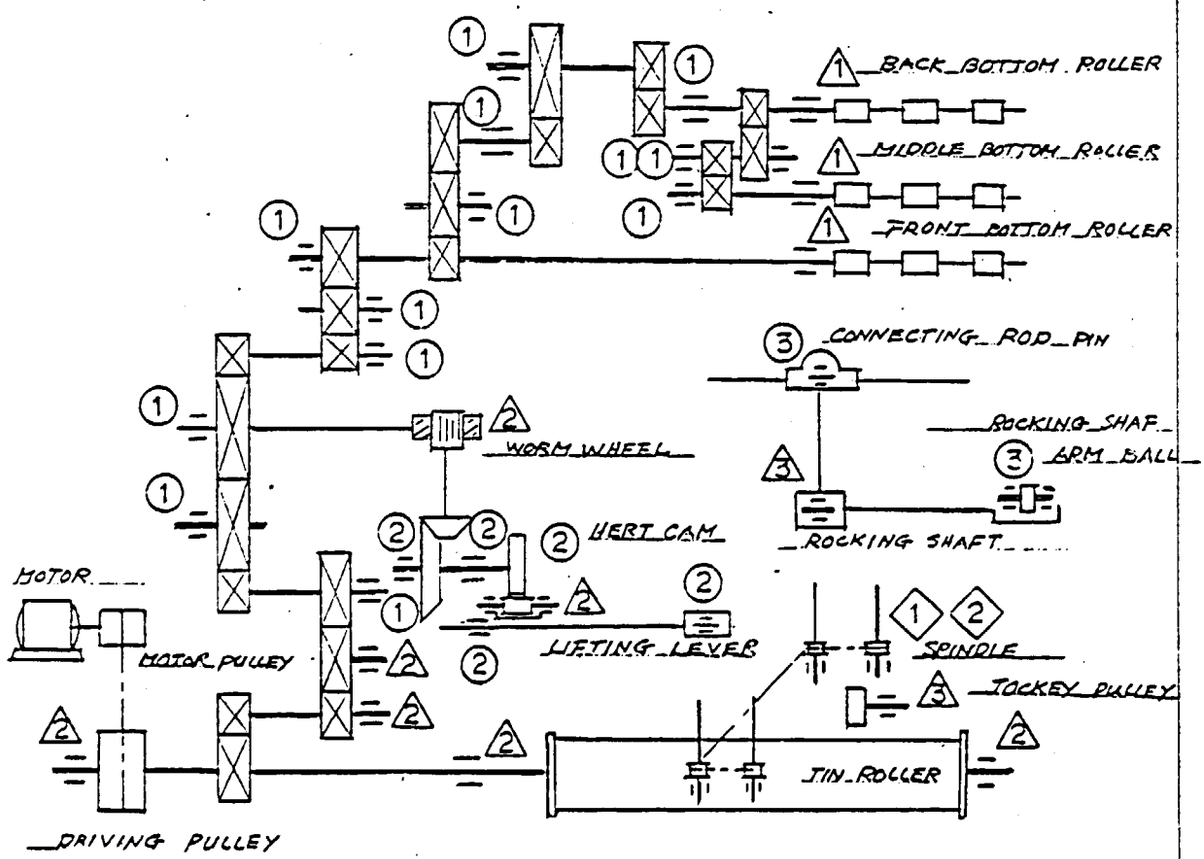
Cleaning on Doffing
A. Spindle rail
B. Lappet pillar
C. Floor under machine and passage
D. Gear end and out end

Machine Cleaning by Worker solely engaged in Cleaning	Once 3 days	1. Neck parts of top & bottom roller 2. Front top clearer roller
Daily Maintenance (by 1 person)	Once a day	1. Replacement of broken spindle tape 2. Replacement of broken top and bottom apron 3. To carry out checking, mending and replacement of parts affecting production control, patrolling each machine. 4. Checking and mending of defective part
Checking on Deterioration of Machinery Function (by 1 person)	Once 6 months	
Checking on Deterioration of Output Quality (Small defect Check by 1 person)	Once 6 months	

RING SPINNING FRAME

LUBRICATION DIAGRAM

SHOWS :- MARKS	KING OF OIL → GREACE	FREQUENCY
①	MACHINE OIL	1 TIME / DAY
②	MACHINE OIL	1 TIME / WEEK
③	MACHINE OIL	1 TIME / 6 MONTHS
△1	GREACE	1 TIME / 1 MONTH
△2	GREACE	1 TIME / 6 MONTHS
△3	GREACE	1 TIME / 1 YEAR
◇1	ADDITION SPINDLE OIL	1 TIME / 6 MONTHS
◇2	OIL CHANGE SPINDLE OIL	1 TIME / 1 YEAR



RING SPINNING FRAME (38SETS OF TOYODA)

1. Ordinary Maintenance of Control Parts

1.1 Frequency

2 months

To be carried out at the same time with "Ordinary maintenance A"

1.2 Number of personnel required

2 (skilled and semi-skilled)

1.3 Maintenance items

1) Check, correction and cleaning inside fuse box and switch box
2) Check, correction and cleaning of each push button switch
3) Check and correction of insulation of each cable
4) Check and correction of earth of each frame
5) Cleaning and lubrication for each motor and check and correction of bearings
6) Check and correction of slack terminal screw
7) Check and correction of defective safety cover of each electric apparatus

2. Maintenance of Spi-Ra-Clean

2.1 Maintenance procedure

1) Care of dust remover
   a) Judging from the outside, when the metallic net may be stuffy with dust, eliminate the dust deposited after disassembling it.
   b) For the disassembling, loosen the nut and remove the metallic net and clean it.
2) Care of filter
   a) Clean the filter at every 30 to 40 hours.
   b) Life of the paper is 60 to 80 hours.
3) For further detail, follow the instruction of handling manual

JOB INSTRUCTION CARD

(Preventive Maintenance Scheme)

1. Department: Spinning 1 Issued by:
2. Machinery: Ring Spinning Frame Frame No.
3. Implementing Date of Assigned Job:
4. Assigned Job (Maintenance Activity): Ordinary Maintenance A
5. Workers Allocated for the Job:

_____ _____ _____

_____ _____ _____

_____

6. Contents of Assigned Job:
   A) Ordinary maintenance A
      1) Disassembling, cleaning, check and lubrication of roller gearing part
      2) Disassembling, cleaning, check and lubrication of gearing part and belt
      3) Disassembling, cleaning, check and lubrication of traverse motion and cap bar part
      4) Adjustment of height of ring rail
      5) Cleaning, check and adjustment of ring rail, lappet bar and lifting motion
      6) Cleaning of each clearer roller
      7) Disassembling, cleaning, check and lubrication of top roller, cradle and tenser bar
      8) Cleaning, check and lubrication of bottom roller part
      9) Cleaning of top board, roller beam and lappet part
      10) Cleaning of ring rail lifting pillar and poker bush
      11) Cleaning of spindle part
      12) Cleaning of tin roller and jockey pulley
   B) Ordinary maintenance of control parts
      1) Check, correction and cleaning inside of fuse box and switch box
      2) Check, correction and cleaning of each push button switch
      3) Check and correction of insulation of each cable
      4) Check and correction of earth of each frame
      5) Cleaning and lubrication for each motor and check and correction of bearings
      6) Check and correction of slack terminal screw
      7) Check and correction of defective safety cover of each electric apparatus
7. Detail of Job Carried Out

   1) Detail of replaced and/or repaired parts

   2) Resulted downtime of machine due to maintenance activity:

8. Confirmation of Fulfilment of Assigned Job:

_____ _____ _____

_____ _____ _____

_____

JOB INSTRUCTION CARD

(Preventive Maintenance Scheme)

1. Department: Spinning 1 Issued by:
2. Machinery: Ring Spinning Frame Frame No.
3. Implementing Date of Assigned Job:
4. Assigned Job (Maintenance Activity): Ordinary Maintenance B
5. Workers Allocated for the Job:

_____ _____ _____

_____ _____ _____

5. Contents of Assigned Job:
   1) All items of 1 to 12 of "ordinary maintenance A"
   2) Check and adjustment of verticality of lifting pilar
   3) Setting adjustment of spindle, snail wire and antinode ring
   4) Check and adjustment of flute and rubber socket of pneuma duct
   5) Check and adjustment of traveller clearer gauge
   6) Check and adjustment of eccentric revolution of bottom roller
   7) Check and adjustment of jockey pulley
   8) Disassembling, cleaning, check and greasing of tin roller bearing
   9) Adjustment of traverse motion
   10) Check and adjustment of spindle tape
   11) Supplementing of spindle oil
   12) Maznetizing of magnet roller

7. Detail of Job Carried Out

   1) Detail of replaced and/or repaired parts

   2) Resulted downtime of machine due to maintenance activity

8. Confirmation of Fulfilment of Assigned Job:

_____ _____ _____

JOB INSTRUCTION CARD

(Preventive Maintenance Scheme)

1. Department: Spinning 1 Issued by:
2. Machinery: Ring Spinning Frame
3. Frame No.

4. Implementing Date of Assigned Job: Daily Maintenance
5. Workers Allocated for the Job:

6. Contents of Assigned Job:
   1) Replacement of broken spindle tape
   2) Replacement of broken top and bottom apron
   3) To carry out checking, mending and replacement of parts affecting production control, patrolling each machine.
   4) Checking and correction of defective part

7. Detail or Special Note of Job Carried Out:

   1) Detail of replaced and/or repaired parts

8. Confirmation of Fulfilment of Assigned Job

JOB INSTRUCTION CARD

(Preventive Maintenance Scheme)

1. Department: Spinning 1 Issued by:
2. Machinery Ring Spinning Frame
   Frame No.

3. Implementing Date of Assigned Job:
4. Assigned Job (Maintenance Activity): Lubrication A, B, C, D
5. Workers Allocated for the Job:

   _____ _____

6. Contents of Assigned Job:
   A) Lubrication A to:
      1) Roller gearing part
      2) Gearing part
   B) Lubrication B to:
      1) Lifting lever nd heart cam part
      2) Traverse motion part
   C) Lubrication C
      1) Lubrication to upright pin
      2) Supplementing of spindle oil
   D) Lubrication D
      1) Greasing of jockey pulley bearing
      2) Greasing of rocking shaft bracket
      3) Greasing of tin roller bearing
      4) Lubrication of rocking shaft ball

7. Detail of Job Carried Out:

8. Confirmation of Fulfilment of Assigned Job:

   _____ _____

JOB INSTRUCTION CARD

(Preventive Maintenance Scheme)

1. Department: Spinning 1 Issued by:
2. Machinery: Ring Spinning Frame
   Frame No.

3. Implementing Date of Assigned Job:
4. Assigned Job (Maintenance Activity): Machine Cleaning
5. Workers Allocated for the Job:

6. Contents of Assigned Job:
   1) Cleaning of top and bottom roller
   2) Cleaning of front top clearer roller

7. Detail of Job Carried Out:

8. Confirmation of Fulfilment of Assigned Job:

JOB INSTRUCTION CARD

(Preventive Maintenance Scheme)

1. Department: Spinning 1 Issued by:
2. Machinery: Spi-Ra-Clean(Auxiliary equipment of Ring Section)
3. Implementing Date of Assigned Job:
4. Assigned Job (Maintenance Activity): Periodical Maintenance
5. Workers Allocated for the Job:

_____

6. Contents of Assigned Job:
   1) Care of dust remover
      a) Judging from the outer appearance, when the metallic net may be stuffy due to dust, eliminate the dust deposited after disassembling it.
      b) For the disassembling, loosen the nut and remove the metallic net and clean it.
   2) Care of filter
      a) Clean the filter at every 30 to 40 hours.
      b) Life of the paper is 60 to 80 hours.
   3) other items
      To obey the handling manual.

7. Detail or special note on job carried out:

8. Confirmation of Fulfilment of Assigned Job:

_____

EQUIPMENTS AND TOOLS REQUIRED FOR PREVENTIVE MAINTENANCE Section: Ring Spinning Frame

Names	Specification	For Ordinary Preventive Maintenance A	For Ordinary Preventive Maintenance B	For Daily Maintenance	For Lubrication	For Operative's Cleaning
1. Tool carrier		1	1	1		
2. Two sided spanner	mm size	1set	1 set	1 set		
3. -do-	inch size	1 set	1 set	1 set		
4. Iron hammer	1 lb	1	4	1		
5. Brass hammer	2 lb		1			
6. Plastic hammer	Small	1	2	1		
7. Driver	(-) . 75mm	1	2	1		
8. -do-	(-) 100mm	1	4	1		
9. -do-	(-) 150mm	1	2			
10. -do-	(+) 75mm	1	2	1		
11. -do-	(+) 100mm	1	4	1		
12. -do-	(+) 150mm		2			
13. T type box spanner	3/8" Square	1	1			
14. -do-	½" square		1			
15. File (medium grained)	flat, round, square	ea.1	ea.1	ea.1		
16. Small plumbing bomb		1	4	1		
17. Level	150mm		1			
18. Plier	150mm	1	1	1		
19. Hexagonal wrench		1 set	1 set	1 set		
20. Pipe wrench or flyer nipper			1	1		
21. Rectifier of spindle gauge		1 set	4 sets	1 sets		
22. Tape measure			1	1		
23. Rectifier of roller bend (Jim-crow)			2			
24. Roller extractor			1 set			
25. Oiler	For spindle oil & machine oil	2	2	2	2	
26. Grease container		1	1	1	1	
27. Grease gun		1	1	1	1	
28. Spilaclean			1		1	
29. Roller support		8	8			
30. Roller gauge			2			
31. Thickness gauge			1			
32. Traveller clearer gauge		1	2	1		
33. Gauge for height of lappet			2			
34. Gauge for alignment of trumpet			2			
35. Tin roller gauge			1			

EQUIPMENTS AND TOOLS REQUIRED FOR PREVENTIVE MAINTENANCE Section: Ring Spinning Frame

Names	Specification	For Ordinary Preventive Maintenance A	For Ordinary Preventive Maintenance B	For Daily Maintenance	For Lubrication	For Operative's Cleaning
36. Tightener shaft gauge			1			
37. Roller for tin roller			16			
38. Gauge for height of ring plate		1	1			
39. Antinode ring gauge		1	4	1		
40. Rectifier of separator bend		1	2	1		
41. Hand brush		7	2			10
42. Fly remover	large & small	ea.7	ea.2			10
43. Cleaner of oil hole		1	1	1	1	
44. Wire brush	For cleaning of	7	1			
45. Brush	gears & spindle tape	6	2			
46. Rag		some q'ty	some q'ty	some q'ty	some q'ty	
47. Roller picker						8
48. French chalk		some q'ty	some q'ty			
49. Cleaning kit for poker bush		1	1	1		
50. Hook of spindle tape			1			
51. Case for cradles		12				
52. Case for top rollers		16				
53. Deck brush		2	2			2

ORDINARY PREVENTIVE MAINTENANCE A

Maintenance Plan and Check Sheet of Ring Spinning Frame No.

Name of machine

year : _____

Name of Work	Remarks of Works	Frequency	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Disassembling, cleaning, inspection and lubrication of roller gearing part														
Disassembling, cleaning, check and lubrication of gearing part and belt														
Disassembling, cleaning, inspection and lubrication of traverse motion and cap bar part														
Adjustment of height of ring rail														
Cleaning, inspection and adjustment of ring rail, lappet bar and lifting motion														
Cleaning of each clearer roller														
Disassembling, cleaning, inspection and lubrication of top roller, cradle and tenser bar														
Cleaning, inspection and lubrication of bottom roller part														
Cleaning of top board, roller beam and lappet part														

ORDINARY PREVENTIVE MAINTENANCE B

Maintenance Plan and Check Sheet of Ring Spinning Frame No.

Name of machine

year : _____

Name of Work	Remarks of Works	Frequency	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Check and adjustment of spindle tape														
Supplement of spindle oil														
Magnetizing of magnet roller .														

Ring Spinning Frame

CHECK LIST OF LUBRICATION A

Name of Work

1. Roller gearing part.
2. Gearing part

Month : _____

date / machinery identification	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Ring Spinning Frame No. 3																															
5																															
7																															
8																															
9																															
10																															
11																															
12																															
13																															
14																															
15																															
16																															
17																															
18																															
19																															
20																															
21																															
22																															

Ring Spinning Frame

1. Lifting lever and heart cam part
2. Traverse motion part

Maintenance Plan and Check Sheet of LUBRICATION C

Name of Work

year : _____

month / machine number	January	February	March	April	May	June	July	August	September	October	November	December
F.No. 3												
5												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												

Ring Spinning Frame

Maintenance Plan and Check Sheet of LUBRICATION D
Name of Work

1. Greasing of Jockey pulley BRG
2. Greasing of rocking shaft BKT
3. Greasing of tin roller BRG
4. Lubrication of rocking shaft ball

year : _____

month / machine number	January	February	March	April	May	June	July	August	September	October	November	December
F.No. 3												
5												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												

Ring Spinning Frame

CHECK LIST OF DAILY MAINTENANCE
Name of Work

1. Replacement of broken spindle tape
2. Replacement of broken top & bottom apron
3. To carry out. checking, mending and replacement of parts affecting production control, patrolling machines
4. Checking and mending of defective part

Month : _____

date / machinery identification	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Ring Spinning F. No. 3																															
5																															
7																															
8																															
9																															
10																															
11																															
12																															
13																															
14																															
15																															
16																															
17																															
18																															
19																															
20																															
21																															
22																															

D A I L Y M A I N T E N A N C E R E P O R T

Ring Spinning Frame Section

DATE/DAY		SIGNATURES	PRESENCE RECORD			
				M	F	T
WEATHER		GENERAL MANAGER	Present			
GENERAL NOTES		MAINTENANCE MANAGER	Absent			
		PRODUCTION MANAGER	total			

NOTES

MACHINERY RECORD

Name of Machine		Record of Major Maintenance/Remodeling Works	
Model Name/Number		Date	Contents of Works
Manufacturing Number			
Manufactured Date			
Name of Manufacturer			
Installed Date			
Machine Identification			
Main Specifications and Remarks			

IMPLEMENTATION SCHEME FOR PREVENTIVE MAINTENANCE

Section Ring Spinning Frame

Maintenance Item Ordinary Preventive Maintenance A Month : Augsut 1984

date / machinery identification	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Ring Spinning F. No. 3														X																	
5														X																	
7															X																
8															X																
9																X															
10																X															
11																	X														
12																	X														
13																				X											
14																				X											
15																					X										
16																					X										
17																						X									
18																						X									
19																							X								
20																							X								
21																								X							
22																								X							

IMPLEMENTATION SCHEME FOR PREVENTIVE MAINTENANCE

Section Ring Spinning F.

Maintenance Item Ordinary Preventive Maintenance B

Month : August/October 1984

date / machinery identification	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Ring Spinning F. No. 3													X																		
5																	X														
7																						X									
8																											X				
9																															X
10	September				X																										
11										X																					
12														X																	
13																			X												
14																								X							
15																												X			
16	October		X																												
17								X																							
18												X																			
19																	X														
20																						X									
21																										X					
22																															X

IMPLEMENTATION SCHEME FOR PREVENTIVE MAINTENANCE

Section Ring Spinning F.

Maintenance Item LUBRICATION B

Month : August 1984

machinery identification \ date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Ring Spinning F. No.23														X							X							X			
24														X							X							X			
25														X							X							X			
26														X							X							X			
27														X							X							X			
28														X							X							X			
29														X							X							X			
30														X							X							X			
31														X							X							X			
32														X							X							X			
33														X							X							X			
34														X							X							X			
35														X							X							X			
36														X							X							X			
37														X							X							X			
38														X							X							X			
39														X							X							X			
40														X							X							X			
41														X							X							X			
42														X							X							X			

IMPLEMENTATION SCHEME FOR PREVENTIVE MAINTENANCE

Section Ring Spinning F.

Maintenance Item LUBRICATION C

year : 1984/85

month / machine number	January	February	March	April	May	June	July	August	September	October	November	December
F.No.23		1985 X						1984 X				
24		X						X				
25		X						X				
26		X						X				
27		X						X				
28		X						X				
29		X						X				
30		X						X				
31		X						X				
32		X						X				
33		X						X				
34		X						X				
35		X						X				
36		X						X				
37		X						X				
38		X						X				
39		x						x				
40		x						x				
41		x						x				
42		x						x				

Annex L

MAINTENANCE STAFF AT VIET THANG FACTORY

SPINNING I

Section		Preventive Maintenance B M	B F	A M	A F	Rotating Shifts			Total	Production Shifts
1	Blowing	7	2						9	6
2	Carding	7	3	3	8				21	6
3	Draw/Rov	8	4	2	16				30	6
4	Ring Tyda	6	3	1	13				23	6
5	Ring Howa	5	3	2	12				22	
6	Wdg/Dblg	3	10						13	3
7	Electric.	11	1			2	2	2	18	
8	Air Cond.	4	3	1		2	2	2	14	
9	Mechanic	3	3						6	
10	Roller Shop		13			1	1	1	16	
	Total								172	27

WEAVING I

Section		Preventive Maintenance B	A Rotating Shifts			
1	Looms		28	29	28	85
2	Looms	39				39
3	Weaving Prep.	23				23
4	Electrical*	6	2	2	2	12
	Total					159

Note:

M = Male F = Female

* also for humidification

Annex M

INPUTS

	Up to 31.12.84	Planned for Project	
UNDP/UNIDO			
Experts: UNIDO	22	24	man-months
Toyobo	61	58	man-months
Software Portion of Contract	313.8	484.1	US$ '000s
Equipment Received	1,199.2	1,200.0	US$ '000s
GOVERNMENT			
Counterpart Staff	110	198	man-months
Support Staff	1,298	3,330	man-months
Equipment Received	3,207.2		VN Dong '000s
Cash Support - Transport	686.7		VN Dong '000s
- Miscellaneous*	717.2		VN Dong '000s

* including salaries, wages, allowances

Annex N

LIST OF MACHINERY AT
VIET THANG INTEGRATED TEXTILE FACTORY

JULY 1983

SPINNING I

		O	S	B
Blowing				
1 Line	Toyoda 1960 (partly dismantled)			
	4 blending feeders		4	
	2 scutchers 40 inch lap		2	
1 Line	Toyoda 1966			
	4 blending feeders	2	2	
	2 scutchers 40 inch lap	2		
1 Line	Saco Lowell 1962/66			
	4 blending feeders	3	1	
	2 scutchers 40 inch lap	2		
1 Line	Hergeth Model SW			
	4 blending feeders	1	3	
	2 scutchers 40 inch lap	1	1	
1 Line	Saco Lowell 1962/66			
	4 blending feeders	2	2	
	2 scutchers 40 inch lap	2		
1	Toyoda 1960 roving waste opener Pin cylinder unsatisfactory	1		
2	Yarn willowing machines out of use since 1976		2	
1	waste baling press	1		
3	air compressors	3		
Carding				
32	Toyoda cards 1961 Can dia. 12 inches (305 mm x 914 mm)	26	6	
137	Howa cards 1962 Can dia. 16 inches	116	21	

		O	S	B
3	Howa cards 1962 Special feed table for waste processing Can dia. 16 inches	3		
3	Ashworth cards Incomplete since installation		3	

Drawframes

16	Toyoda drawframes Model DK = 8 sets each 2 machines Can dia. 12" Creel feeding 8 slivers Each drawframe 4 deliveries	14	2	
16	Saco Lowell drawframes 1962 = 8 sets each 2 machines Can dia. 16" Model DA 8C Creel feeding 8 slivers Each drawframe 2 deliveries	14	2	

Roving Frames

12	Toyoda Model FAS 1960 124 spindles Package size 250 x 110 mm Distance inside flyer legs 120 mm Roving bobbin length 305 mm Feed can dia. 12 inches	10	2	
18	Toyoda Model FAB 1963 96 spindles Package size 250 x 110 mm Distance inside flyer legs 150 mm Roving bobbin length 305 mm Feed can dia. 16 inches	11	7	

Ring Frames

43	Toyoda Model RF 1960 400 spindles Gauge 76 mm Ring dia. 51 mm Creel gauge 153 mm Tube length 232 mm Dia. 27/21 mm	36	7	
61	Howa Model SF 1962 400 spindles Gauge 76 mm Ring dia. 45/51 mm Creel gauge 153 mm Tube length 232 mm Dia. 27/21 mm	41	18	2

		O	S	B
12	Saco Lowell Model 15E 1964 384 spindles Gauge 83 mm Ring dia. 51 mm Creel gauge 194 mm Tube length 255 mm Dia. 29/22 mm		8	4
	Doubling Machinery			
1	Franz Muller Single End Singeing Frame 60 winding positions. Not used since 1975		1	
2	King Kong Assembly Winders 1961 Each 120 drums	1	1	
9	Kyoritsu Twisting Frames 256 spindles Ring dia. 65 mm	1	8	
2	Suessen Twisting Frames		2	
8	Vietnamese Twisting Frames 448 spindles Ring dia. 51 mm Ring tube length 230 mm	1	7	
	Winding			
6	Murata Cone Winders 1961 120 drums	4	2	
10	King Kong Cone Winders 1961 120 drums	6	4	
1	Leesona Cone Winder 1961 120 drums		1	
	Reeling			
3	Reeling Machines	2	1	
2	Yarn Bundling Presses	2		

Note: O - Machine in Operation
S - Machine Stopped owing to lack of spares
B - Machine Stopped to balance production

SPINNING II

		C	S	B
Blowing				
1 Line	Quinn 1973			
	4 CAMCO Type 33 Pre-openers	2	2	
	Centrif Air Machine Co. 1973			
	2 CAMCO Type XL Cleaners	1	1	
	2 scutchers 40 inch lap	1	1	
1	Quinn mixed waste opener	1		
1	Toyoda 1966 roving waste opener Type BL 14		1	
1	Air compressor	1		
Carding				
40	Toyoda Cards 1960 Can dia. 16 inches	32	8	
8	Toyoda Cards 1960 Can dia. 12 inches		8	
	Processing of polyester fibre usually carried out on 16 cards			
Drawframes				
16	Whitin drawframes 1972 = 8 sets each 2 machines (1 set in Spg I) Can dia. 20 inches (504 mm) Creel feeding 8 slivers Each drawframe 2 deliveries	9	7	
4	Toyoda drawframes Model DKH = 2 sets each 2 machines Can dia. 16" Creel feeding 8 slivers Each drawframe 4 deliveries	4		
Lap Forming				
2	Whitin Super Lap Machines 1969 Model H1 Feeding 60 slivers Lap width 280 mm (Located in Spinning I)	1		1

		C	S	B
Combing				
2	Whitin Combers 1963 Feed 8 laps per machine			2
14	Whitin Combers 1963 Feed 8 laps per machine Condition poor in general (14 combers located in Spinning I)	3		11
Roving Frames				
8	Whitin 1971 96 spindles Package size 270 x 130 mm Distance inside flyer legs 172 mm Spindle speed 700 rpm Polyester/cotton 5 frames Feed can dia. 16 inches Cotton 1 frame Feed can dia. 20 inches	6	2	
Ring Frames				
50	Whitin Model N2 1971 400 spindles Gauge 77 mm Ring dia. 45 mm Creel gauge 150 mm Frame lift 200 mm Spindle speed 40s polyester/cotton 10,000 rpm 30s cotton 8,500 rpm	42	8	
Winding				
3	Barber Colman Spoolers 1971 Machine Nos 2511 2512 2513 Traveller Nos 2530 2529 2528 KK 216 bobbin pockets Suction not working	2	1	
1	Barber Colman Auxiliary Winder	1		
1	Air compressor	1		

		O	S	B
1	Taming Cone Winder 1962 120 drums	1		
1	Murata Cone Winder 1962 120 drums	1		
1	King Kong Cone Winder 1962 120 drums	1		
1	Reeling Frame		1	
1	Spindle Tape Machine	1		
1	Yarn Conditioning Unit Type H - W Industrial Dryer Corporation (electrical controls out of order)		1	

WEAVING I

Winding

2	Barber Colman Spoolers Machine Nos KK 2500 2501 Traveller Nos 2519 2520 216 bobbin pockets		2	
1	Barber Colman Auxiliary Winder		1	
1	Air Compressor		1	
2	King Kong Cone Winders 120 drums	1	1	

Warping

1	Barber Colman Warper Model DW Creel 540 ends using cones not BC spools	1		
3	Kanamaru Warpers 1961/1963 Magazine creel 500 ends	3		

Sizing

2	size cooking tanks each 900 litres	2		
2	size storage tanks each 900 litres	2		
2	West Point Sizing Machines 1960 Warper beam creel for 9 or 10 but some positions damaged	2		

		O	S	B
Drawing-in				
1	Reed making machine Pitch bound reeds Max. length 80 inches	1		
15	Drawing-in frames Manual with travelling selectors (Todo)	12		3
Pirn Winding				
80	Scharer spindles = 8 machines each 10 spindles	67	13	
160	Hacoba spindles = 4 lines each 10 units x 4 spindles (2 complete lines inoperative)	77	83	
120	Schweiter spindles = 2 double sided lines each 18 - 24 - 18	114	6	
16	CSSR spindles = 2 lines each 2 units x 4 spindles	16		
Cropping				
1	NIKKI (Japanese) 1964		1	
Inspection				
1	Unrolling machine	1		
20	Tables (mechanical unrolling inoperative)	20		
3	Kyoto plaiting machines	3		
Weaving				
553	Toyoda Type GP 44 inch automatic looms (Weft replenishing mechanism inoperative)	549	4	
311	Toyoda Type GP 52 inch automatic looms (Weft replenishing mechanism inoperative) Fitted with dobbies - 154 looms Yamada Dobby DY Type VS 16 jacks	199	12	100

WEAVING III

		O	S	B
Warping				
1	Barber Colman Warper Model DW Creel 540 ends using cones	1		
1	King Kong Warper Fixed Cone Creel 544 ends	1		
Sizing				
1	West Point sizing machine 1971 Creel for 12 warper beams 9 drying cylinders	1		
Drawing-in				
5	Drawing-in frames	4		1
Pirn Winding				
120	Scharer spindles = 12 machines each 10 spindles (1 machine completely stopped)	100	20	
Pirn Stripping				
1	Terrell pirn stripping machine		1	
Weaving				
200	Draper X 3 looms 1971 Width 72 inches 6 shaft lifting motion Operating as manual weft changing loom	200		
100	Draper X 3 looms 1971 Width 72 inches 20 jack dobby		100	
100	Crompton and Knowles C11 Looms 1971 Width 72 inches 4 x 1 drop box 20 jack dobby		100	
Inspection				
10	Inspection Tables	8		2
1	Plaiting Machine 1972 Curtis and Marble	1		

FINISHING DEPARTMENT

Condition:
1 Satisfactory
2 Working - some reconditioning required
3 Working - major reconditioning required
4 Occasional use - major reconditioning required
5 Stopped - major reconditioning required
6 Obsolete

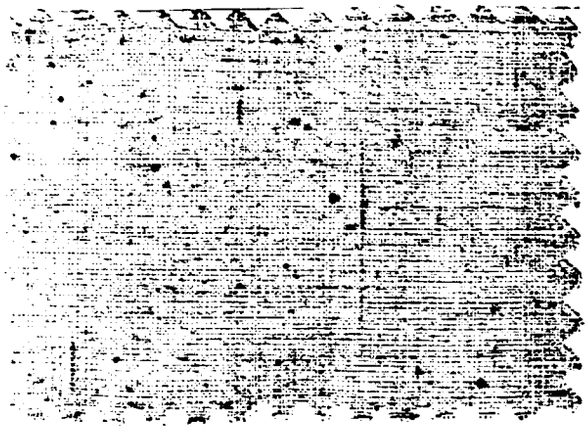
Ref		Roller Width mm		Condition
1	No. 1 Open Width Bleaching Range Rodney Hunt 1960 Idle: guide rollers; mangles 3,4,8,10,12: middle set (12) drying cans	1370		3
2	No. 2 Rope Bleaching Range Kyoto 1960 In use: singe and quench tank	1370		5
3	No. 3 Open Width Bleaching Range Morrison 1971 Idle: cloth brushing; scray; steaming chamber; guide rolls; several drying cans		1780	3
4	Mangle and 16 drying cans Kyoto	1370		6
5	No. 1 Mercerizing Range Kyoto 1961	1270		6
6	No. 2 Mercerizing Range Morrison 1964	1400		6
7	No. 3 Mercerizing Range Morrison 1971		1670	5
8	Dyeing Range No. 1 Kyoto 1961 Pad dry/Pad steam	1270		4
9	Dyeing Range No. 2 Kyoto 1961 Aniline dyeing Steam ager Partly dismantled	1270		6

Ref		Roller Width mm		Condition
10	Dyeing Range No. 3 Morrison 1971 Pad - Dry - Thermosol		1780	1
11	Roller Printing Machine 6 colours Kyoto 1961 Idle: 4 printing rollers: first set drying cans (8)	1270		3
12	Roller Printing Machine 6 colours King Kong 1961	1140		3
13	Steam Ager			6
14	Hot Flue 9A Heater 50KW Kyoto 1962	1270		2
15	Hot Flue 9B Heater 20 KW Kyoto 1962 (Near Stenter No.2)	1270		2
16	Hot Flue Butterworth 1972		2200	1
17	Washing Range No.1 Sando 1962		1650	5
18	Washing Range No.2 Morrison 1971 Idle: Williams wash unit 15 p s i; mangle 1; middle set (10) drying cans plus several others		1670	2
19	No. 1 Finishing Stenter Kyoto 1960	1280		2
20	No. 2 Finishing Stenter Morrison 1962	1320		1
21	No. 3 Finishing Stenter Butterworth 1972 Idle: impregnating mangle - no pressure; preheater - hot air - oil conbustion; infra red		1900	2
22	Two Raising Machines King Kong 1961		2050	2

Ref		Roller Width mm		Condition
23	Compressive Shrinking No. 1 Morrison 1961 Planned to be transferred		1570	5
24	Compressive Shrinking No. 2 Morrison 1971 poor apron		1720	2
25	Calender - 5 bowls Kyoto 1961	1480		5
26	Calender - 2 bowls Kyoto	1280		5
27	Calender - 3 bowls Sando 1963		1650	5
28	Two Inspection Machines Kyoto	1370		5
29	Inspection Machine Vietnamese			5
30	Doubling/Winding Kyoto 1960			5
31	Two Plaiting Machines Kyoto	1270		2
32	Plaiting Machine MAE	1270		2
33	Two Doubling/Plaiting Menschner			3
34	Plaiting Machine Curtis and Marble 1960		1930	1
35	Plaiting Kyoto	1270		1
36	Two Inspection Machines Kyoto	1370		5
37	Two Tube Rolling Machines			5

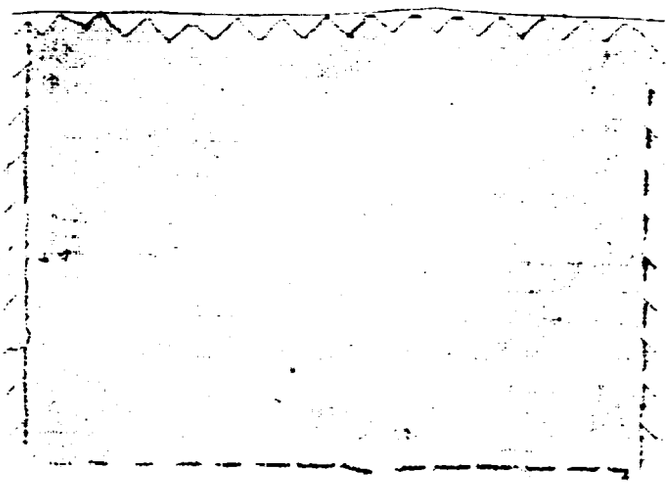
Annex O

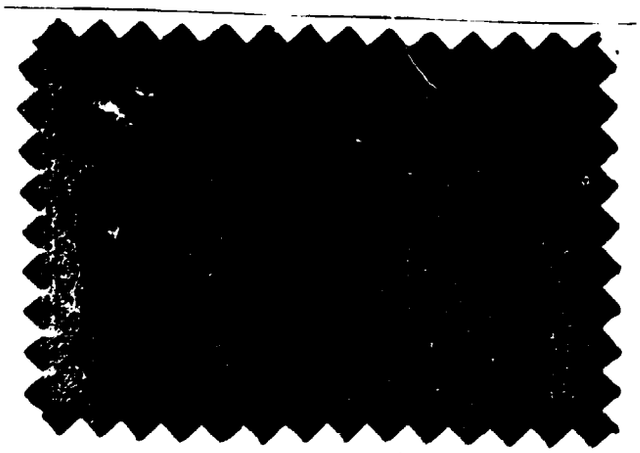
FABRICS PRODUCED BY VIET THANG FACTORY



GREY CALICO

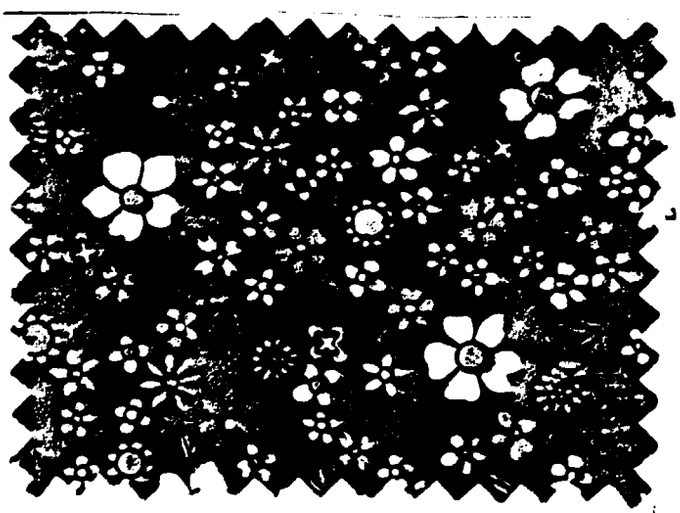
BLEACHED CALICO

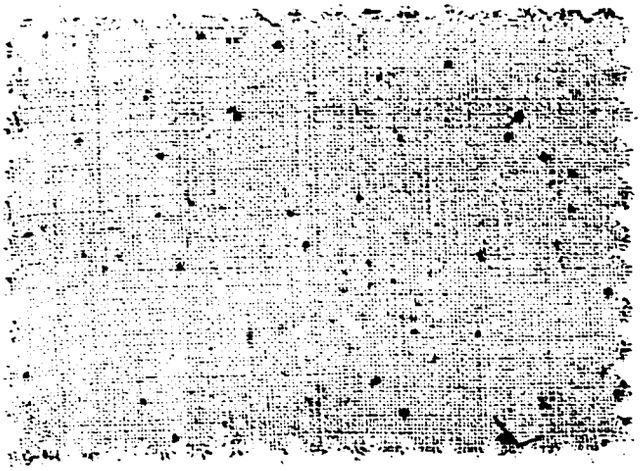




DYED CALICO

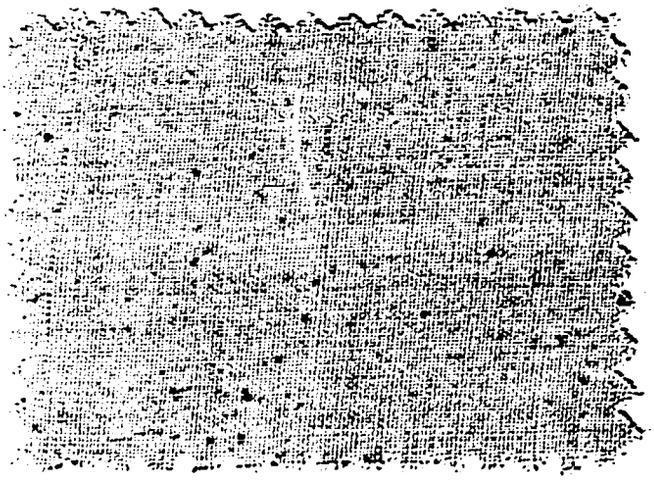
PRINTED CALICO





4444

Raised



Grey simili

Dyed simili