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DP/ID/SER.A/966
8 February 1988
ENGLISH

16606

STRENGTHENING OF THE CHINA RAMIE TECHNOLOGY DEVELOPMENT CENTRE

DG/CPR/85/057/11-01

PEOPLE'S REPUBLIC OF CHINA

Technical report: First mission*

Prepared by the Government of the People's Republic of China
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

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V.88-21310

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ABBREVIATIONS

CTA	Chief Technical Adviser
BASF	Badische Anilin und Soda Fabrik
ICI	Imperial Chemical Industries
HRTRI	Hunan Ramie Textile Research Institute
PRC	People's Republic of China
NPD	National Project Director

Exchange rates:

During the period of this mission, 15 November, 1987 to 14 December, 1987, the following exchange rate prevailed:-

US\$1 = RMBY 3.71

Abstract The CTA on his first visit to the PRC spent two weeks stationed at Changsha and had a series of meetings with Counterpart staff, visited the HRTRI, the site of the new Central Laboratories and two leading mills. He now has a clear overview of the problems and anxieties and in this first Technical Report analyses some of the problems and puts forward strategies for their resolution.

The main conclusions and recommendations are that the first priority must be an effective solution to the degumming problem, a major improvement in mills' productivity, a carefully planned removal to the new central laboratories, the putting into effect of a comprehensive and intensely industry-related research programme, placing of Fellows and ongoing maintenance of buildings and equipment. Constant and effective communications with the mills through the use of a computer linkage is advocated.

INTRODUCTION

UNIDO/UNDP involvement - historical

This project should have begun in September, 1986 (see document PR/85/05) However, for a number of reasons we must now assume that - apart from the Study Tour of the orientation group to Great Britain, Italy and West Germany from May 16th 1987 to June 18th 1987 - this project should be deemed to have officially begun with the visit of the CTA, November 1987.

The work of Dr. Chien Chu, U.S.A. expert in Ramie degumming - mission period from Sept. 16th to Oct 20th 1986 - although of considerable academic interest and merit, must, from a practical standpoint, be disregarded.

The finding of an intensely practical solution to the degumming problem remains the most urgent and important objective of this project.

1. CURRENT STATUS

A. Central Laboratories

- 1 Pending the completion of the new building at Changsha, the Central Laboratories will continue to be housed in the old six - storey building in Xiangtan City. This building is, obviously, quite unsuitable for use as Headquarters of the China Ramie Technology Development Centre. It was not purpose-built and because of the ad-hoc location of the various departments, instruments and facilities, some unavoidable dissipation of energies, resources and general efficiency must ensue. It lacks a fundamental requirement of a modern scientific laboratory - a controlled atmosphere - vital for the reproducibility and reliability of many tests. It must, however, be emphasized that despite the difficult working conditions, excellent equipment does exist and there is a very competent and dedicated staff.
- 2 For Senior Counterpart Staff, see Annex I
- 3 Current staffing level at HRTRI is 160, 70 of whom are Technicians, including Laboratory Technicians. The labs. are staffed by 21 of these, nine of whom are trainees who have passed the National Examinations.
- 4 The Chinese National Standards apply to the labs.
- 5 For assistance in sourcing some special machinery and equipment, see Annex II
- 6 For list of equipment currently available, as well as available tests, see Annex III.
- 7 For additional equipment already ordered, see Annex IV

B. The Mills

- 1 The Zhuzhou Ramie Textile Printing and Dyeing Factory.
This factory employs 5,400 and has 15,152 spindles for long-staple Ramie spinning, 8,912 spindles for short-staple Ramie spinning, 650 looms, one printing and dyeing production line and a total annual production of 3,876 tonnes of yarn, 13,350,000 metres of ramie fabric and 12,000,000 metres of printed and dyed cloth.

The mill has eight departments which are:-

- . Degumming
- . Carding
- . Spinning
- . Preparing
- . Weaving
- . Printing and Dyeing
- . Powerhouse
- . Machine Repair Shop

This mill also has its own routine testing laboratory

- 2 The China Hunan Dongting Ramie Textile Mill
This mill employs 6000 and is of recent construction and equipment. Apart from their own requirements for in-house weaving and commissioned Flat-bed knitting, a sizeable proportion of yarn is exported on hank. Much grey cloth is also exported for dyeing.

- 3 Difficulties and shortcomings
Both mills share similar problems, the greatest of which is the messy and difficult as well as costly degumming process.

II SUMMARY OF PROBLEMS IN THE MILLS

MY OBJECTIVE OBSERVATIONS AT BOTH MILLS ARE AS FOLLOWS:-

- . Degumming process
- . Intermittent water extraction
- . No preventive Maintenance
- . Small package Flyer and Ring frames
- . Knotting of yarn
- . No ear protection in extremely noisy environments
- . A number of extremely hazardous machines without guards
- . Old pattern cone-to-hank winding machines
- . Inadequate methods and standards of cloth inspection.
- . Clearing of fly by hand
- . Hand doffing of spinning machines
- . No recycling of extracted oil (at degumming stage)

III THE SOLUTIONS

A. The New Central Laboratories

These will be situated in Changsha, capital of Hunan Province - a very central situation from the point of view of the location of the Ramie fibre production and processing industries. The existing laboratory building is located quite some distance from the logical centre - Changsha - in the town of Xiangtan. See Annex No VII.

In addition to the enlarged and augmented laboratory facilities as well as staff, the new buildings will have a pilot production plant capable of carrying out realistic trials and experiments in all aspects of simulated mill production. See Annex No V for site plan of new Headquarters.

The new unit will also provide practical training facilities for technicians and operatives.

Existing Equipment - see Annex No. III

New Equipment - see Annex No IV

Other important additional facilities These will include studies in automation, Information Technology and a well-equipped degumming laboratory.

B. The Mills

1. Degumming The existing mill-scale degumming systems as practised in China are generally regarded as the greatest obstacle to progress and efficiency in Ramie preparation for downstream processing. Because of the greatest concentration of Ramie production being in the PRC there has been a reluctance on the part of Western textile chemists, technologists and machinery manufacturers to invest in an area which to them does not promise significant financial returns on any research expenditure.

One notable exception is the French textile machinery manufacturer, Laroche, 69470 Cours-la-Ville, by whom I am assured that their degumming system works very efficiently. However, in order to prove that this is indeed the case, I am recommending to the NPD that one Tonne of green Ramie fibre (i.e. in its normal state before degumming) should be sent to this firm. I am prepared, with UNIDO'S approval, to attend at the Laroche premises and observe and monitor the test run. An obvious advantage of this course of action is that we would then have in Europe a good supply of degummed Ramie fibre which could be allocated to a selection of spinning machinery manufacturers in order to establish the most suitable equipment for any re-equipment programme for the mills.

2. Water-extraction I am recommending the replacement of the centrifugal-type hydro-extractors as seen in both mills visited by modern Roller Squeezers, thus giving an uninterrupted sequence of operations instead of the present troublesome, inefficient and very dangerous method (Hydro-extractors are being run without covers) In the 1987 ITMA Catalogue, heading No.256, some 52 manufacturers of Squeeze Rollers are listed.

3. Sizing and Desizing In order to speed-up and improve as well as to greatly reduce the cost of this process, I have suggested to the NPD the following three experiments:-

- 3.1 Singeing of warp, possibly thereby bypassing of sizing
- 3.2 Substituting of Slasher-type sizing, as currently practised, by waxing the warp sheet at the beaming stage, using a water-soluble wax.
- 3.3 Combining the above two processes
- 3.4 By means of hollow spindle wrapping, partly cover - the degree to be established by experiments - the Ramie yarn with a very fine PVA or other water-soluble filament, thus eliminating yarn hairiness and reducing warping to a straightforward one operation process and obviating the need for sizing and desizing.

4. Beating machines These are extremely crude machines although they produce good results that, so far, have not been improved upon by any other method. The principle is a pre-removal of gums through mechanical (beating) action and copious water-rinsing. 26% of gums are removed through the combination of boiling-beating-washing over five passages.

I am hopeful that, either through research directed by an expert Textile Chemist, or through the 'discovery' of some existing process (cf. Laroche) it will be feasible to eliminate this process. In the event of failure, I feel that by paying much greater attention to modern engineering, this machine is capable of being greatly upgraded, e.g., by the use of Carbon-fibre reinforced composites for gears and beaters and the use of hydraulic pressure instead of springs, thus making for much quieter running as well as improving efficiency, machine wear life and power consumption.

5. Flyer and Ring Spinning I am concerned that the extremely small yarn packages currently being produced are already causing unnecessarily low efficiency as well as considerable Quality Control and mending problems downstream. It must be emphasised that in the event that modernization of weaving to Rapier and /or air jet looms is accomplished, large knot-free packages would be essential. Replacement of spinning machinery should include automatic doffing and fly removal. Automatic yarn splicing to replace knotting should also be introduced.

6. Weaving Shuttle looms only are generally employed. The type I saw had automatic shuttle-changing, ran at 130rpm and were weaving fabric 140 to 145cm wide. Workers did not have ear protection. Looms are of Chinese manufacture and date from the 1970's. Allocation of looms per weaver is 8 to 12 for cloth of 50 ends and picks per inch (20e&sp/cm). The most common yarn counts is Nm 36. I have recommended to the NPD that the Central Laboratories should be equipped with both a Rapier and an Air-Jet weaving machine, in order to assess whether one or both loom types would best suit the Ramie industry. I feel that it would be a fundamental error to simply opt for Rapier weaving whilst the possibility of much higher speeds exist with Air-Jet machines.

Weaving contd.

I also pointed out to the NPD that a market survey should establish if there were any important customers who would continue to insist upon receiving Ramie fabrics having true selvages. In the event that that were so a case could be made for retaining a small part of the existing shuttle loom installations but charging a premium price for such fabric. I feel that where such is practicable, tucked-in selvages will be generally acceptable.

7. Drawing-in and Warp Tying Machines These great aids to productivity do not appear to exist in this industry and I am, therefore, strongly recommending their installation.

8. Bobbin-stripping machines These also do not appear to exist (I saw only hand-stripping of bobbins) An improvement in productivity would result from the use of this equipment.

9. Fabric Inspection Machines I am recommending the use of modern machines with the facilities of accurately categorizing fault types, marking these on the cloth and by way of a microprocessor, maintaining a log automatically of all faults. This would be an important aid to Quality Control and also benefit the mender.

10. Reeling Machines The machine that I saw at the China Hunan Dongting Ramie Textile Mill was quite an old type model and I feel that productivity as well as package style would be improved and the possibility of labelling would be provided by an up-to-date machine. I am thinking in particular of the Croon + Lucke range of machines.

11. Preventive Maintenance This practice does not, as far as I can establish, exist and I am, therefore, strongly advocating it. I feel that this is an important area for scientific study - relative to all mill-installed equipment - at the HRTRI and that appropriate mill technicians should receive training there.

12. Microprocessor-control This dimension of the mills' development will derive from the HRTRI 'Automation Department'

Note re Spinning Three distinct spinning systems are in general operation. These are:

- . long-staple spinning - akin to Flax Line Spinning
- . Medium - staple spinning - akin to the Wool Worsted System
- . Short - staple spinning - akin to the Cotton System

IV TIME SCHEDULE

1. New Central Laboratories Building work is in progress and will continue during 1987 and is scheduled for completion by end 1988. However, it is anticipated that by end March, 1988, a Dormitory and some Workrooms will be ready and that some office staff and technicians will be able to move in. It is envisaged that at this stage approximately 100 people will be able to move in.

At this stage it will be possible, in conjunction with the old building, to commence research and prepare for the complete transition to the new building at the end of 1988.

All new, imported equipment will be available by 1989.

It is hoped that the complete transition can be effected by March 1989.

Laboratories will be moved only after December, 1988.

Note I pointed out the very real possibility of protracted deliveries of machinery and equipment from Europe and that, therefore, the HRTRI should guard against any disruption of research work arising from such an eventuality. I therefore recommend that any absolutely essential equipment/service of the old labs. should remain operative at the old location for as long as necessary.

2. CTA's assignments The NPD fully agrees that my next visit to China should coincide approximately with the current one, i.e., October/November 1988, for a similar duration.

2.1 CTA's European assignment Following discussions with the NPD and Counterpart Staff, it is strongly recommended that I should undertake some vital liaison work on behalf of HRTRI in Europe, perhaps during March 1988. This work would involve:

- . Visits to Universities/colleges of Technology in order to plan and organize the proposed Fellowships, including the finding of suitable accommodation. See Annex No VI
- . Visits and general liaison with machinery and equipment manufacturers
- . Visits to headquarters of a number of the leading European Chemical manufacturers to discuss the possibilities of collaboration with the Chinese authorities and in particular HRTRI in making available the personal services of one of their leading Chemists for (say) a one m/m mission to China

Note: The general list of Chemical Companies would include such names as:-

- . Bayer, BASF, Ciba-Geigy, Sandoz, Henkel, Rohm & Haas, ICI as well as any others, e.g., smaller companies such as Tennants with long experience in the Flax and Jute industries.

3. Move to new central laboratories - the logistics. The elements of a smooth transition must be very carefully planned. I have suggested the following to the NPD and Counterpart Staff.

- 3.1 Superimpose onto graph paper an accurately-scaled set of drawings of the floor plans of the new buildings.
- 3.2 On similar graph paper, draw accurate outlines to same scale of each piece of machinery and equipment, allowing correct alleyway and juxtaposition spacing.
- 3.3 Apply a code number to each piece of machinery and equipment as represented by each 'cut-out'.
- 3.4 This method will allow for totally flexible planning until eventually a fully discussed and agreed layout is possible.
- 3.5 At this stage the agreed disposition of machinery, equipment and services should be officially ratified and the positioning of the scaled cut-outs finally fixed.
- 3.6 The physical positioning of all items of machinery and equipment requiring a Standard Atmosphere will have been allocated appropriate accommodation.

4. Retention of vital test equipment at old centre As already stated any vital and regularly-used test instruments/ equipment must be the last to be moved and this move should be made over a weekend or holiday period in order to assure the mills of an uninterrupted service. In case of any anticipated difficulties, the mills should be requested to send urgent test requirements in good time and should be asked to agree a definite 'cut-off' point for any such tests.

5. Recalibration and checking Obviously, the relocation move will inevitably lead to the need for recalibration and checking of many instruments before these can be used with full confidence in routine test work; due time allowance must, therefore, be made for this.

6. Packing and transport I am recommending the hiring of a good modern van-type vehicle for the transport of all items from the old labs. to the new central labs. Good shock-absorbing packing materials should be used to encapsulate delicate instruments and only responsible technical staff should be employed throughout the actual move as such people will find it in their own interests to see to it that all possible care is taken.

V. MANAGERIAL CONTROL

A. In-mill tests

1. The SRTRI should make arrangements whereby all routine in-mill tests are relayed to them on an immediate basis, preferably via a computer linkage or at least by Telex. In this way they will be provided with full and vital information at all times and be in a position to monitor all parameters for which in-mill testing will be available.

B. Central Laboratory Tests

2. All Central Laboratories' test results of immediate concern to the mills should be relayed to the mills on an immediate basis.
3. Where urgent corrective action is indicated, a fail-safe system for making the appropriate mill technician aware must be devised and agreed.
4. All records of logged and analysed results should be available to the mill technicians.

VI. PROGRAMME OF ORIGINAL RESEARCH

1. For details of a proposed programme, see Annex No. VIII
2. Research findings should be recorded in Report form and copies made available to all interested parties.
3. The prestige of the HRTRI will be greatly enhanced through the contribution of Heads of Research to appropriate learned Journals not only in the PRC but worldwide. Similarly, research staff should be encouraged to give lectures, talks or seminars on interesting aspects of their work.
4. Any patentable discoveries/developments should be duly protected by taking out patents in appropriate countries.

VII. MAINTENANCE

A special maintenance routine programme should be prepared for both buildings and machinery and equipment in order to ensure a continuity of the best possible environments and efficiency of machines and equipment.

VIII. STAFFING LEVELS

Staffing levels should be reviewed on at least an annual basis and due promotions made.

IX . REVISED PROJECT PERSONNEL REQUIREMENTS

1. Degumming Expert

The possibility arises that should it be possible to retain the services of a senior chemist from one of the big chemical companies, the one person would be capable of fulfilling the roles of Dyeing and Finishing expert also.

The Counterpart Team have expressed the wish that the degumming expert - who should be very familiar with the technology-should, before visiting China, do the following:-

- . Carry out some lab. experiments
- . Visit some degumming installations

Upon his visit to China, he would be expected to:-

- . Give full details of his findings
- . Carry out practical in-mill trials

The big chemical companies should be encouraged to set up a joint venture with a Chinese company for the production of the requisite chemicals/agents/auxiliaries. Considering that the current expected Ramie fibre annual tonnage is approximately 400,000, one would expect a positive response.

A preference has been expressed for a Biological degumming agent, perhaps of the Enzyme type. Eliminating the use of oil would be a distinct advantage.

The NPD would prefer to acquire the technology totally rather than being obliged to purchase (say) the Laroche plant; in other words he would like to keep his options open.

2. Spinning expert

Spinning in China is very labour-intensive with low efficiency and long processing lines. It is hoped to reduce the labour content and to generally improve efficiency. The spinning Expert should be able to demonstrate how to achieve this goal. He should introduce new technology and develop new products, including novelty/fancy yarns.

2.1 He should visit China for one month starting May 1988

3. Weaving Expert

The NPD hopes that a suitable Weaving Expert will visit China and confirm which looms are best-suited to the weaving of Ramie, as well as the anticipated blends and other yarns to be used in the future.

3.1 He should visit China for one month in June 1988

4. Knitting Expert

This expert should be experienced in single jersey Jacquard circular knitting and be able to fully explain modern patterning systems.

4.1 He should visit China for one month in October/November 1988

5. Note concerning experts

I feel that each expert should have the duty of arranging appropriate visits to Europe by Chinese technicians following his duty term in China. The obvious logic of this arrangement is that the experts will have acquired a clear understanding of the precise kinds of experience in Europe providing the greatest advantages to the Chinese technicians. The greatest advantage of this proposed arrangement will be that the experts will by then know each of the technicians personally and have had time to discuss their respective requirements.

5.1 It should be noted that because of temperature and climatic conditions in China, the period July-Sept must be excluded from any visiting programmes for Europeans.

6. Study tour of Philippines/Japan

It is too early to decide upon an exact time but this should be arranged after June 1988.

7. The Next Review Meeting

This depends on UNDP but can be roughly scheduled for mid 1988.

8. Full year's review

This should coincide with the CTA's visit Oct/Nov 1988.

9. Some minor notes

- . The medium-staple worsted-type process is giving unsatisfactory results, including neps and other fabric faults. Advice is sought on how to up-grade this process.
- . Ramie is a very abrasive yarn on thread guides and a solution is sought indicating the best types of thread guides plus any suitable thread lubricants

10. Design and Styling

Although clearly not part of the CTA's brief, I have been requested to suggest someone or some organisation who could be of most benefit. This is a task that I could confidently undertake but UNIDO's and UNDP's approval are now sought. Any such assignment would logically follow the installation and commissioning of the new machines.

11. Information Technology Expert

I am strongly recommending the appointment of an expert in this field to be available for one month in China as soon as the move to the new Central Laboratories will have been completed. In addition to training the key staff he may make recommendations for the purchase of any additional equipment/facilities deemed important.

ANNEX I

Senior Counterpart Staff

Department of Foreign Affairs Ministry of Textile Industry	ZHU XIJG Ph.D., Senior Engineer
Ramie Textile Research Institute of Hunan	XU KUI, Director (MPD)
Ramie Textile Research Institute of Hunan	XIANG CE XUAN Vice Chief Engineer
Ramie Textile Research Institute of Hunan	TAN AL LI Vice - Chief Engineer
Acting Interpreter	HUANG SHAO SHI - Knitting Technology Trainee/Fellowship Candidate

OTHER PEOPLE MET

Hunan Association of Science & Technology Standing Member of the Committee, Hunan Provincial Planning Committee Science & Technology Dept. Chief	LIU JING
Hunan Provincial Commission of Foreign Economic Relations and Trade; Foreign Economic Cooperation Department (Section Chief)	ZHU JIAN FANG
Hunan General Textile Industrial Corporation (Vice Chief Manager)	DU FU XIN
Zhuzhou Ramie Textile Printing & Dying Factory (Vice Director)	WANG RONG WANG
Zhuzhou Ramie Textile Printing & Dying Factory (Deputy Chief Engineer)	GUO MAOQUAN
Zhuzhou Ramie Textile Printing & Dying Factory (Deputy Chief Engineer)	GUAN DEHUA
China Hunan Dongting Ramie Textile Mill (Chief Engineer)	YAO RUI-YUAN
Senior Staff at HRTRI	TAN HAI LEE, JING YON LO BISIANZHEN

ANNEX II

Assistance in sourcing some special machinery and equipment

1. Single jersey circular Jacquard knitting machine. I will request a quotation for the independent assessment of a suitable machine by the Irish Institute for Industrial Research. Ramie yarns to be provided by HRTRI would be used in the assessment.
2. Waxing device for warp sheets (to replace sizing)
3. Six-head cone winding machine capable of:
 - . winding hank to cone
 - . winding different angle cones
 - . winding soft cones for dyeing
 - . winding cop to cone
 - . with waxing discs
 - . counts ranging 6^s - 60^s Nm
 - . with slub catchers
4. Resin-finish application and baking machines - laboratory-scale- for fabric widths of 30-60cm

ANNEX III

Equipment List - currently available

Machine Type	Type	No/off	Made in	Year
. Blow room machine	LA004	1	China	1981
. Carding machine	A186	4	"	"
. Drawing frame	A272	2	"	"
. Roving frame	A452	1	"	"
. Ring spinning frame	A513	3	"	"
. Drum-type winder	1332M	1	"	"
. Ring twisting machine	A631	1	"	"
. Reel	-	1	"	"
. Winder	G191	1	"	"
. Beam	-	1	"	"
. Loom	1511M-44"	8	"	"
. Loom	1515M-56"	4	"	"
. Loom	1515A-75"	4	"	"
. Circular weft knitting machine	Z113-18" 22", 30"	3	"	1982

New machinery

Long staple spinning equipment:

. Breaking Machine	C111B	1	"	1986
. Carding machine	CE191	3	"	"
. Gill box	B304	1	"	"
. Combing Frame	B311(CZ)	9	"	"
. Drawing frame	B423, B432	3	"	"
. Roving frame	CE411	1	"	"
. Double roving frame	CZ421	2	"	"
. Ring spinning frame	FZ501	4	"	"
. Drum winder	1332M	1	"	"
. Sizing machine	G142-180	1	"	"
. Jacquard loom	1515A-63"	2	"	"
. Weft knitting machine	24"	1	"	1985
. Baling machine	M492	1	"	1986

Wool-worsted type spinning machines:

. Softening machine	CZ141	1		1986
. 1st Flyer Frame	CZ411	2		"
. 2nd Flyer Frame	CZ412	2		"
. Hammer Machine	CZ041	1		"

ANNEX III continued

NOTE: where country of origin not stated this is PRC

Fibre Test Equipment

Name of Tester	Type	Manufacturer
Fibre Specific Electric Resistance Apparatus	YG321	
Comb Fiber Length Analysis Apparatus	Y121	
Airstream Fiber Tester	Y145	
Zhukofu Fiber Length Analysis Apparatus	Y111	
Comb Wool Length Analysis Apparatus	Y131	
Fiber Friction Coefficient Apparatus	Y151	
Curl Elasticity Apparatus	YG361	
Fiber Melting Point Tester	YG231	
Fiber Projecting Apparatus	XJ9-1	
Digital Fiber Fineness Meter		
Electronic Strength Tester	YG002	
Digital Integral Apparatus	YG002	
Densimeter	MD-01	
Microtome	Y172-SM	
Fibre Microtome		202
Torsion Balance	JN-A	
Torsion Balance	A19	
Microscope	XPB-01	
Microscope	XSB-01	
Microscope	XSB-04	
Microscope	XSP-18A	

ANNEX III (contd)

Yarn Test Equipment

Name of Tester	Type	Manufacturer
Uster Evenness Meter	1-B	Swiss
Uster Single Yarn Strength Tester	Tensorapid	Swiss
Uster Yarn Faults Meter	Classmat-11	Swiss
Automatic Electronic Count Balance	Uster11	Swiss
Pin Grooved Drum Machine		
Hairiness Tester	Shirley 98	U.K.
Lea Strength Tester	YG025	
Single Yarn Strength Tester	Y361-1	
Single Yarn Strength Tester	Y36-30	
Sliver and Roving Length Tester	Y301A	
Sliver and Roving Evenness Tester	Y311	
Hand Twist Tester	Y321	
Yarn Twist Tester	Y331	
Lea Length Tester	YG086	
Sample Yarn Winder	Y381A	
Yarn Elastic Tester	Y341	
Textile Humidimeter	Y411	
Electrostatic Tester	JFY-YR-2	
Spun Yarn Quadrant Balance	YB73	
Yarn Torque Balance	YG152	
Chain Weights Balance	TL-02	
Daniel Balance	Y871	
Table Balance	AGT -10	
Photoelectric Balance		
Electronic Balance	QD-1	
Medicine Balance	HCTB11B5	
Timing Speed Gauge		
Manostat	WAD-2	
Eight-Basket Drying Oven	Y802A	
Yarn Examining Machine	Y721	
Cross-winding Machine		
Uster Autosorter	11	Swiss
Snag Tester	T8	

ANNEX III (contd)

Fabric Test Equipment

Name of Tester	Type	Manufacturer
Cloth Hand Meter	SYG5501	
Standard Photo-Resource		West Germany
Snag Tester	Shirley 78	U.K.
Cloth Breaking Tester	YG031	
Cloth Strength Tester	Y302	
Cloth Counter	Y511	
Pilling Tester	YG501	
Cloth Thickness Tester	Y531	
Cloth Crease Elastic Tester	YG511	
Cloth Emergind Machine	YU522	
Disc Cloth Resistance to Abrasion Tester	Y522	
Whiteness Meter	ZBD	
Dust Exhauster	U2 40	
Direct Current Radiation Stream Examiner	AC15 4	
Cloth Permeometer	Y561	
Curl Yarn Length Tester	YG111	
Dye Friction Fastness Apparatus	YG571B	
Dyeing Waterfast Tester	SLO-12	
Iron Sublimation Fastness Meter	YSS-02	
Sampler	YG502	
Chain Weights Balance	TL-02	
Eight-Basket Constant Temperature Drying Oven	YO2a	
Single-Cylinder Washing Machine	2PB20	
Electrothermo Constant Temperature Water Bath	HHS	
Electrothermo Constant Temperature Water Bath	HHS21 B	
Cloth Tearing Tester	YG033	
Standard Fade Meter	YG611	

ANNEX III (Contd)

Chemical Test Equipment

Name of Tester	Type	Manufacturer
Air Electric Resistance Stove	SY 13 9	
Temperature Controller	DR21	
Airflow Drying Oven	GD65 1	
Vaccum Drying Oven	668	
Refrigerator		
Magnetic Heating Stirrer	771	
Magnetic Saturation Manostat		
Electric Sand Bath		
Water Bath Pan		
Electrothermo Constant Temperature Water Bath Pan	214	
Electrothermo Distilled Water Container		
Acidimeter	25	
Electric Analysis Photometer	72	
Water-Content Speed Tester	SC69-62	
Chain Weights Balance	TL-02	
Medicine Balance	HCTD12D10	
Electric Balance	TG328A	
Electric Balance	TG328B	
Single Plate Balance		

METERING GROUP

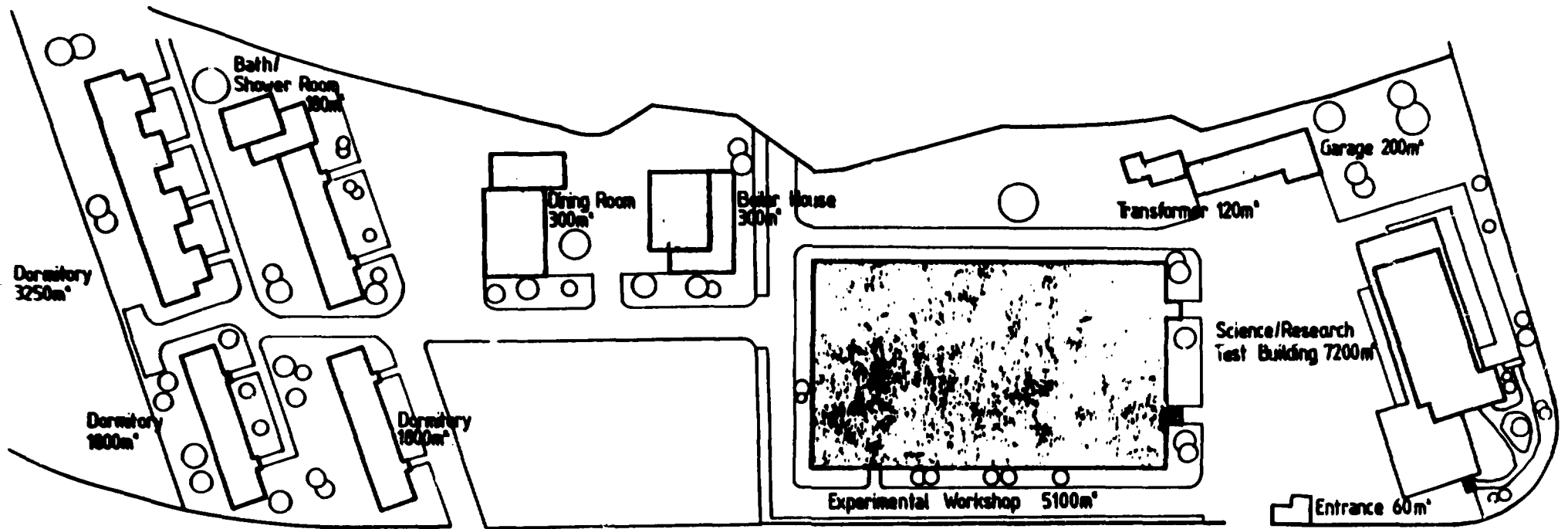
Standard Force Measuring Lever
Two Grade Standard Weights
Mini-Balance
All-Automatic Electric Balance
Electric Blower

ANNEX IV

Additional equipment some of which already on order

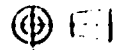
- 1 Fancy yarn doubling frame
- 2 Large diameter Jacquard weft knitting machine
- 3 Rapier loom
- 4 Air-Jet weaving machine*
- 5 High temperature package dyeing machine
- 6 Laboratory dyeing and finishing machine
- 7 Single end sizing machine
- 8 Infra-red Spectrum Tester
- 9 Hairiness Meter
- 10 Sunlight and weathering fastness tester
- 11 Fabric style tester
- 12 Instron Tensile Tester

* New recommendation



Ramie Development Centre

Kilkenny Design Co.



WORKS **RAMIE DEVELOPMENT CENTRE**
THE SITE PLAN OF NEW RAMIE DEVELOPMENT CTR.

Horizontal Scale:

Scale: 1:1000

Scale: 1:1000

Scale: 1:1000

Date: 4/1/1988

ANNEX VI

Fellowships

The existing tentative programme as cited in page 17 of the Project Document will require considerable modification in the light of enquiries already made and a number of severe difficulties. This situation can only be resolved satisfactorily through the intervention of the CTA.

Fellowships required are:-

- 1 Degumming - two of six months during each year 1988/89
- 2 Spinning - one of " " " " " "
- 3 Weaving - two " " " " " "
- 4 Knitting - " " " " " "
- 5 Finishing - two of " " " " " "
- 6 Textile Testing
and Quality C. two of three months "
- 7 Microelectronic
machine control two of 12m/m each during " "

ANNEX VII

Map of Hunan Province giving locations of mills and research institute including New Central Laboratories at Changsha



ANNEX VIII

Tentative outline programme of original research

- . Specification for crude Ramie fibre required for consistent efficient modernized degumming processes.
- . Noil and waste reduction by applying new degumming technology
- . Grading systems for Ramie fibre aiming at the production of fine pure Ramie tops.
- . New additives/oils for accelerated degumming; bio-degumming
- . Cost comparison of alternative degumming methods.
- . Test results of research programmes
- . Test results of industrial applications in selected Ramie textile mills.
- . Establish optimum performance criteria for a range of yarn counts and types, including such parameters as fibre fineness length, stiffness, tensile strength, number of fibres per yarn cross section, degree of twist, yarn regularity, lustre, hairness.
- . Draw up performance standards for yarns spun on all three systems.
- . Establish which cloth specifications best suit
 - a) Ravier weaving
 - b) Air Jet weaving
- . Establish which yarn specifications best suit Circular Jacquard knitting machinery; any other type knitting machinery as used by the Ramie textile industry.
- . Establish the most suitable ranges of dyestuffs, chemicals and auxiliaries both from the effectiveness point of view as well as the cost.
- . Establish the best finishing procedures from both quality and cost aspects.