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ASSISTANCE TO THE NATIONAL NETWORK FOR
STANDARDIZATION, METROLOGY AND QUALITY TESTING AND
CALIBRATION SERVICES - (PHASE III)

DP/VIE/86/037

VIET NAM

Technical report: Textile and light industries testing*

Prepared for the Government of the Socialist Republic 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 C. Natcha,
expert in light industrial (textile) testing

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Vienna

* This document has not been edited.

Introduction

According to the job descriptions Centre I. in Hanoi and Centre II. in Danang were expected to be the duty stations of the expert with travel within the country. Expert should have been a member of an international team attached to the Metrology and Testing Centre I. in Hanoi and Centre II. in Danang, both belonging to the General Department for Standardization Metrology and Quality Control (GDSMO). Expert was expected to fulfil the following tasks:

1. Assist in the installation and putting into operation of the textile testing equipment including preparation whenever required of operational manuals or instructions as well as instructions on the maintenance and servicing of equipment.
2. Prepare and conduct short-term training courses or lectures combined with practical training for laboratory personnel in various methods and techniques used for testing textile materials.

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3. Advise and assist in developing methodology for conducting laboratory tests, results, analysis and records keeping.
4. Advise, and if required assist in design and application of quality control methods and techniques to be used in textile industries.
5. Develop Quality Manual for Centre I.
6. Provide consultancy on quality control of cotton fibres.
7. Carry out consultancy on computer applications in Light Industry Laboratory.

Recommendations for Centre I (including rationals for those that require significant budgetary commitments)

- To complete the Quality Manual of vietnamized version according to the expert's version.
 - To create a new status of the Director of Test and Quality Assurance in Light Industry Laboratory.
 - To elaborate the code for Test Data Sheet.
 - The staff has to fulfil an audit before Accreditation of Testing Laboratory.
 - For calibration, maintenance and repair of the testing equipment it is recommended to create a status of electro-mechanic who has to be experienced in this field of activity. This member of staff should perform with prescribed frequencies the following tasks:
 - maintenance and repair
 - checking and maintaining the spare parts
 - instrument calibration and performance check
- When it is not possible to carry out the above mentioned tasks in parts of a full time activity then it is strongly recommended to execute them part time (i.e. after his/her main duties) by an expert who knows very well the testing equipment in question and can carry out his/her part time duties regularly.

- To provide further training for the staff (especially for testing the quality of fibres).
- To recruit at least 3 additional personnel for L.I. Laboratory.
- To purchase additional equipment and a computer system for completing the set of testing procedures for quality control of fibres.

Rational: The textile laboratory of Centre I. is well equipped with testing instruments, standards, manuals and other publications necessary to carry out its tasks of testing. However for more efficient utilization of the available resources, it is worth to equip the laboratory with a computer system. This system could improve the efficiency of test report and certificates preparation, and also allows collection of test data in computer files for further comprehensive analysis and reporting.

Using such a system the laboratory will be able to organize a Test Record Book that may contain the following information:

- file number and code
- name and address of the client
- product description (commercial name, brand name, specific characteristics, as: place of sampling, sampling data etc.)
- specification of the test procedure (ISO, ASTM, standards of Vietnam)
- reasons of testing
- qualification of the tested unit
- recommendations
- signature, date.

By having such a storage elaborate data (including an expert opinion, report etc. - whichever necessary) can be printed in any required forms: report, graphics etc. The collected information may be later used for inspection and control. In present project it is recommended to order:

Version 1. Macintosh Classic 2/40 with 2 Mbyte RAM, 1.44 Mbyte Superdrive and 40 Mbyte hard disk (included into the equipment list, as the minimum computer hardware to be purchased)

or **Version 2.** Macintosh IIsi 5/80 with 5 Mbyte RAM, 1.44 Mbyte Superdrive and 80 Mbyte hard disk (when a larger budget is available) any of them with **Laserwriter** printer from Apple and

with suitable selection of software: MS Word for Macintosh (word processing), MS Excel for Macintosh (spreadsheet), MS Works (integrated file-manager, word processor and spreadsheet package for simpler operations), "Thunder" (spelling checker) and 4th Dimension (a more sophisticated database manager)

The Macintosh computer system is recommended because of its easy-to-use interfaces, based on point-and-shoot commands, directly manipulated windowing technology and large selection of software relying on these advanced features. The staff of the laboratory can learn and handle such a system with the utmost easiness, and no specially trained personal is required to help them in this matter.

- To improve the procedure by making the test set for quality control of fibres complete, and by having all the data available for preparation of a Test Report and evaluation of the quality of the fibres in Centre I.

Rational: Sixty to eighty percent of the finished textile cost goes to the purchase of the raw fibre. Thus raw fibre is the most expensive factor in producing yarn. In countries with not so effective market possibilities (such as Vietnam) large quantities of raw fibre are usually purchased. To produce textile goods from cotton Vietnam purchased on the international market 80 % of the raw material used. Expert therefore recommends the consideration of acquiring a "Spinlab HVI System" in order to carry out the quality control of cotton fibres in most proper way. This system should be installed near the central stock of the purchased raw material.

List of the equipment and computer system recommended for purchase:

Item	Description, specification	Qty.	Price US \$	Catalogue	Remarks
1	Accessories for whethering tester XENONTEST 250: - Xenon burner, type NXE 2700 A. Order No. J01795 - Thermal fuse 109 °C Order No. 036702 - Light intensity meter	1 10 1	500 100 100	Original Hanau Quarzlampen GmbH. Hohensonne str. 6450 Hanau T.06191/363/1 GERMANY	spare parts
2	IlC-Shirley fineness/maturity Catalogue No. SDL 89	1		Shirley Development Ltd.	for fibre testing
3	International calibration cotton Catalogue No. SDL 24A	1b		Crown Royal, Shawcross str. Stockport,	
4	Shirley autowash, single bath, total vessel capacity 4 tube, Catalogue No. SDL 228A	1		SK1 3JW ENGLAND	for color fastness to washing
5	British standard 1006:1978 Color fastness to light - BO1C LFS5 reference standard 25 cm x 15 cm for No. 1 - ditto for No. 2 - ditto for No. 3 - ditto for No. 4 - ditto for No. 5 - ditto for No. 6 - ditto for No. 7 - ditto for No. 8	2 2 5 5 5 5 2 2		The Society of Dyers and Colorists, P.O.Box 224 82 Grattan Road Bradord West Yorkshire BD1 2JB	

Item	Description, specification	Qty.	Price US \$	Catalogue	Remarks
6	Computer of type Macintosh-Classic 2/40 with 2 Mbytes RAM, the 1.44 Mbyte superdrive floppy and an internal 40 Mbyte hard disk, mouse, keyboard: 101 keys, monochrome monitor (black/white or color monitor RGB)	1		Apple Centre Tricom Pacific PTE Ltd. 152 Beach Road 0100 Gateway East, Singapore 0718, tel: (65) 298-0123 fax: (65) 292-2678	
7	LaserWriter printer from Apple	1			
8	3.5" diskettes	10 box.s			
9	Software: MS-Word, 4th Dimension, MS-Excel, MS-Works, "Thunder"				

List of recommended books to be purchased:

The library should be extended by some reference-type books and magazines dealing with textiles:

1. Textile Research Journal from IRI/Princeton
2. Identification of Textile Materials, published by the Textile Institute, Manchester (last edition)
3. Physical Properties of Textile Fibres by Morton-Hearle, published by the Textile Institute, Butterworths, Manchester, London (last edition)
4. Statistical Methods for Textile Technologists by Murphy, Morris and Tippett, published by the Textile Institute, Manchester (last edition)
5. Chemical Testing and Analysis, Text. Inst., E.B. James
6. The Production and Properties of Wool and other Animal Fibres, Text. Inst., M.L. Ryder
7. Developments in Finishing of Cotton and Man Made Fibre Fabrics, Text. Inst., D.H. Wyles

Workplan of the textile expert Mrs. Nacsa in Centre I., Hanoi

1. Arrival in Noibai airport
2. Meeting with Project Authorities, Centre i., and staff of L.I. Laboratory
3. Working program with L.I. Laboratory:
 - discussion, information
 - fibre testing
4. Working program with L.I. Laboratory:
 - design of the process of testing in the laboratory
 - computerised laboratory
 - laboratory accreditations

The main activities In Centre I., Hanoi:

Expert arrived at duty station on 25th of December. Details of the agreed expert work, that are also in compliance with the job description are given in the workplan above. According to the requests of her counterparts expert concentrated her activities on the subjects, that were most important for the improvement of the Light Industry Laboratory operations:

1. According to the reviewed situation there expert prepared recommendations for a **Quality Manual** as a guidance to the laboratory. The elements of quality system established in this way assure that the laboratory is fully prepared to be internally accredited. Annexes attached to the quality manual give further assurance in improving the efficiency of the laboratory's operation.
2. It is expected, that in the frame of this project Light Industry Laboratory has to acquire the knowledge necessary for application of computers to its operations. Expert therefore gave a short seminar on training to use electronic data processing equipment and related terminology. Consultancy on the application of computers in testing procedures was also given, along with a recommendation to purchase the necessary computer configuration.
3. The staff of the laboratory asked the expert to held a 5 days training course in quality control and testing of cotton fibres. During this course the maintenance of the available instruments (FM-27, FM-10) was carried out as well as tests performed. In order to make proper considerations about purchasing one HVI

Spinlab system written explanations of that system's operations were given to the course participants, along with oral tuition and consultancy.

Recommended basis for Quality Manual of the Light Industry Laboratory

Procedures of quality control of textile products in Centre I. Have undergone a considerable development since 1982. The second phase of UNDP/UNIDO assistance under project VE/81/006 was carried out from June 1982 to March 1985 within the framework of the 1982-1986 Country Programme. Laboratory facilities were improved and the technical knowledge of staff was considerably brought up to date.

This basis for Quality Manual is intended to assist personnel of laboratory to properly evaluate quality of industrial products in Vietnam. The quality system of L.I. Laboratory, its equipment, test procedures, and staff's professional knowledge elaborate all necessary elements for accreditation. UNIDO/UNDP assistance is able to speed this process up.

This basis for Quality Manual has been developed for the Quality System of the laboratory, to serve for internal use in the institute, and also to make the accreditation of the institute possible. The Quality Manual developed on this basis can only be used for accreditation procedure. The copies of the Quality Manual, describing the Quality System in effect, shall be distributed among the staff members and have proper, individual indication numbers.

A properly organised filing system should operate in L.I. Laboratory, with files details of which are described in annexes:

- File of Testing Equipment (annex 3)
- File of Standards (annex 4)
- File of operating instructions for testing procedures (annex 8)
- file for maintenance and instrument calibration (annex 5)
- file for samples (annex 6)
- file of Test Data (annex 11)

Definitions:

Content of the Quality Manual gives the most important aspects of the evaluation of the existing quality system by reflecting its most important element, as:

- environment, organizational structure
- equipment
- test methods and procedures
- test reports and documents
- records
- staff
- verification.

1. Quality Policy

1.1 Environment, organizational structure

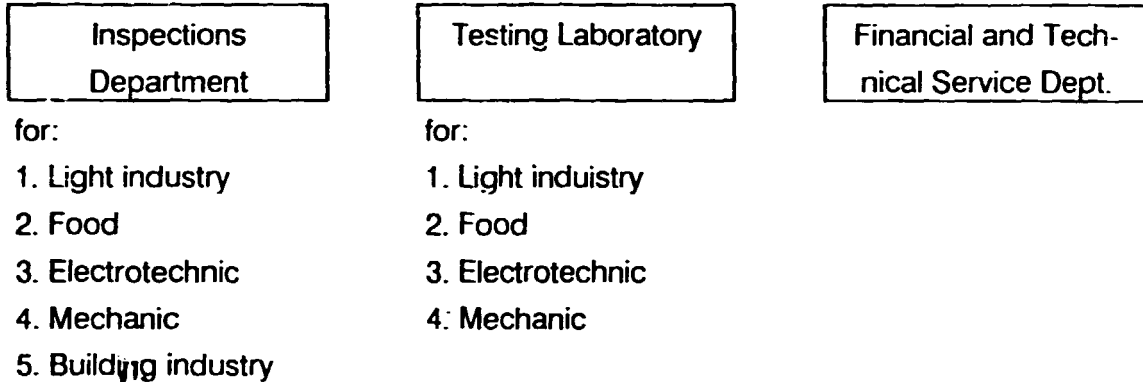
The most effective way to determine the capability of an organization is to evaluate:

- quality policy and practice
- facilities which determine the characteristics of textile products and materials
- testing procedures (including methods and reports)
- staff.

In the structure of legal status of the institute the Light Industry Laboratory belongs to the General Department for Standardization, Metrology and Quality Control. In this capacity it is independent of any manufacturer's and trading organizations, as well as of customers. It is financed partly from the budget of the General Department for Standardization, Metrology and Quality Control, and partly from its own income. However the latter one is quite modest at the moment, since the fee for inspecting the quality of products is very low in Vietnam. At the same time this kind of financing gives very positive results in the activities of the institute.

The organizational structure of Centre I. is the following:

Director General: Mr. Hoang Manh Tuan
Deputy Director General: Mr. Hoang Van Lai



The Light Industry Laboratory operates within the frames defined by Director General's instructions, and also by Regulations of Establishments of the General Department for Standardization. In order to perform testing properly the staff has to know the standards and methods of quality control in the industry and trade, and also strictly follow the procedures of testing.

The concrete responsibilities for quality assurance procedures for each member of the staff are included in Staff Descriptions. A technical manager is responsible for organizational structure and for the schema of services (Annex 2), as well as for Operating Instructions for testing procedures (Annex 8) defined for each testing standard used. Furthermore the client may generally choose the standard according to which the testing procedure should be carried out. The file of Operating Instructions for testing procedures is generally written in Vietnamese. For the new and future testing procedures the Operating Instructions (Annex 8) are first written in English and later they should be translated to Vietnamese (after the training course is completed on them).

The laboratory environment should be cleaned daily and also more space is needed for proper arrangement of the working space where testing is carried out. Furthermore enough natural light should be provided as well.

The rooms in the laboratory have airconditioners. However fibres are very hygroscopic and change their properties if they are exposed to temperature and relative humidity changes. And such changes are very much in place for Vietnam.

Therefore the Light Industry Laboratory needs a special room for testing fibres with facilities delivering standard atmosphere for testing. When such a room is missing no one could be sure that individual test results are reliable and acceptable at all, not to speak of their comparative value. For that reason the laboratory has to purchase a climatic unit, which could deliver the standard atmosphere required for fibre testing.

In addition certain instruments are required as well, that are considered to be basic ones for testing the quality of fibres, but missing at the moment:

- Shirley fineness/maturity tester type FMT2
- Shirley Analyser MK II for determination of the trash content of the cotton samples into five fractions.

Finally the quality system should be systematically and periodically reviewed by or on behalf of technical managers to ensure the continued effectiveness of the arrangements. Such a review should be carried out at least once in every half year.

1.2 Quality System of the L.I. Laboratory

1.2.1 Test Equipment

A record to be kept about every test equipment used in the laboratory is included into Annex 3. At least the following data are to be included into it:

- name and description of the equipment
- identification by type/model and serial number
- date of installation
- manufacturer's name and address

1.2.2 Operation of the Test Equipment

The structure and content of the Operating Instruction for Testing Procedure is described in Annex 8. of the Quality Manual. Such an instruction should be compiled by the laboratory in accordance with the Operational Manual supplied by the manufacturer. A copy of the operating instruction should be fixed on the wall beside the equipment. In Annex 8. an example is given how to compile such an operating instruction.

There are numerous advantages of having such an instruction. Eg. new technicians could easily carry out the required test procedure by studying the relevant operating instruction.

In addition to having the instruction a special Book of Daily Use of the Testing Equipment should be kept in which the date and period of using the equipment is recorded properly (Annex 7).

1.2.3 Quality Assurance

1.2.3.1 The procedure of Technical Test and Calibration (whenever it is necessary) should be carried out with great care and attention. For every equipment the procedure of calibration has to be performed in a prescribed way, according to the manufacturer's manual. For some instruments the calibration has to be performed before start of testing.

To every equipment a label of calibration should be attached. This label should describe (in addition to the name of the equipment):

- a local identification number
- and the last and next dates of calibrations (Annex 10.)

In addition a form on calibration dates should be kept separately (Annex 5.).

1.2.3.2 Maintenance and Repair of the Test Equipment

Till December of each year head of the laboratory should prepare the yearly plan for planned maintenance activities. In this plan for every test equipment:

- its name and local ID
- location
- the activities to be carried out
- the date of last maintenance
- and the date of next maintenance

should be specified properly (Annex 9.).

In the case of frequently used equipment the prescribed maintenance and calibration activities should be performed more frequently.

It is also the task of the head of the laboratory to supervise any maintenance activities carried out by an outside service company. Smaller repairs should be

Ma - Material

Mw - woven material

Mk - knitted material

Pa - Paper

Le - Letter

Ru - Rubber

Pl - Plastic etc.

1.2.3.5 Book (file) of Test Records should also be kept with the following content:

- File identification number and code
- Name of the client
- Identification of the item tested
- Date when the test was started
- Date when the test was completed
- Identification of the test method
- Name of the operator and his/her signature

After completion of the test L.I. Laboratory should prepare in typewritten form the Expert Opinion Report. Person responsible for calculation of the testing fees should meanwhile prepare the invoice to the client. The report and the invoice are then sent to the client while their copies are filed in a Safe Room.

1.2.3.6 The Environment of the Testing Procedure

The environment of the testing procedure is prescribed for the testing procedure by the standard:

- temperature
- humidity

The conformance of the environment to these requirements should be assured by regular inspections, as well as the conformance to any standard atmosphere prescribed for the given procedure.

1.2.4 Proprietary Rights and Confidentiality of the Information

Test results, even partial ones are considered to be official secrets and as such are to be handled confidentially.

Test results and the content of the test report can be given to the client after the test procedure has been carried out completely and the testing document has been signed by the head of the laboratory and director general. Information on the phone can only be given by the head of the laboratory or the director general.

Information, however, could also be given at the request of governmental or national authorities if they have the license required. For other legal entities information can only be provided on the basis of the written permission of the client.

Laboratory technicians should store their books of registrations of the test results in easily accessible drawers equipped with proper locks. Completed reports and books of official registrations should be stored for a minimum of 5 years in a lockable cabinet accessible only to the head of technicians. Copies of the test reports should be stored meanwhile for at least 10 years.

For a regular client test reports may be delivered by mail or directly. "Confidential" marking may be used according to the wishes of the client. For non-regular clients the clients themselves should be called to collect the test report and other documents, and also make the necessary payments on the spot.

External persons can, on a date previously agreed, observe the tests carried out when they have the permission of the director general or of the head of the laboratory. Such persons should be accompanied by a staff member of the laboratory. The staff have to take care that such persons will not be able to watch any other tests, especially those that are performed on behalf of competing companies.

1.2.6 Staff

1.2.5.1 System of Supervision for the Quality Manual

The staff of the L.I. Laboratory and the assessment of their competence are given in Annex 13.

The total staff of the L.I. Laboratory consist of 7 persons:

Quality Management Staff:

- Head of the laboratory: Mrs. Tran Kim Anh
- Quality Manager for testing textile, paper and rubber products
responsible: Mrs. Kim Anh
- Quality Manager for testing chemical testing of textile and paper products
responsible: Mrs. Thuy
- Quality Manager for testing rubber products
responsible: Mrs. Van
- Number of Quality Management Staff: 3 persons

All of them have proved to have the necessary education, knowledge and experience in handling the testing equipment and in carrying out professionally the testing procedures (Annex 13). They also know well the theory of the applied testing methods and can use those according to the standards prescribed.

Duties of the Quality Management Staff:

- To know all the standards related to the tasks of L.I. laboratory
- To perform testing procedures and carry out inspections of the test results
- To check the testing results and prepare the typewritten Test Reports
- To prepare purchasing requisitions for testing equipment and their necessary spare parts
- To pay attention to the conditions of the test equipment and devices used (physical, electrical, mechanical and metrological)
- To ensure that the equipment used in the laboratory performs the test accurately
- To order the necessary repairs

(In all the above duties a proper holiday plan should be prepared in a way that ensures all the necessary deputies for the duties shared between the managers.)

- To train and supervise technicians working under them, or the industrial staff trained by the Centre
- To establish and adopt test methods for the products
- To perform research and promote technological development in the related industrial sector

- To be responsible for the financial plan of the laboratory, and be able to meet the budgetary requirements
- To be a responsible person in case of fire and other accidents
- To prepare subcontracts
- To carry out verification

The Quality Management Staff carries out all the changes that may effect the prescriptions of the Quality Manual. Those changes have to be immediately reported to the director general in form of a circular. The additional arrangements or modifications have to be included into the Quality Manual within three weeks.

Priorities of the rights to the instruction and signature of the technical manager are:

1. Mrs. Kim Anh
2. Mrs. Thuy

Furthermore Mrs. Thuy has full deputy responsibilities in Quality Management of textile products. Both of them are appointed by director general. Other tasks apart of the deputy responsibilities are defined by the Quality Managers themselves.

Laboratory Technicians:

- number of the staff of technicians: 4 persons
- head of the staff of technicians: Mrs. Diep

Duties of the head of the staff of technicians and of technicians themselves:

- To know how to handle the equipment
- To know the standards related to the tasks of the L.I. Laboratory
- To perform the testing procedures
- To calculate the results of testing
- To control the results of testing
- To prepare the test results in a tabular form for evaluation
- To carry out daily maintenance and cleaning of the testing equipment belonging to their section.

1.2.5.2 Training of the Staff of Technicians

The more experienced members of the laboratory staff should train and inspect others regularly on the following subjects:

- Knowledge necessary to handle the equipment
- Test procedure performance according to the testing methods prescribed

In addition regular inspections should be carried out to secure the performance of the testing procedures according to their prescriptions, including the levels of accuracy in measurements, their observations, calculations and recording.

1.2.6 Quality System Audit (internal)

The Quality System Staff regularly reviews the Quality System of the laboratory and every half year prepares a report to the head of L.I. Laboratory, including recommendations for the changes. Head of the laboratory in turn prepares the final report submitted to the director general. Any necessary modifications can then be introduced after his recommendations.

The suggested internal auditing activities have to be linked with the general auditing practices of the whole Centre I, and have to be assessed and audited to ensure a successful accreditation.

An appropriate audit plan has to be formulated and established on a regular basis (Annex 14). Such an audit plan has to cover the following:

- Specific activities and areas to be audited
- Qualification of the personnel carrying out the auditing
- Audit report: conclusions, recommendations
- Basis for auditing (organisational changes, routine checks and surveys etc.)

After auditing evaluations have to be done and an audit report has to be prepared for the management.

LIST OF ANNEXES

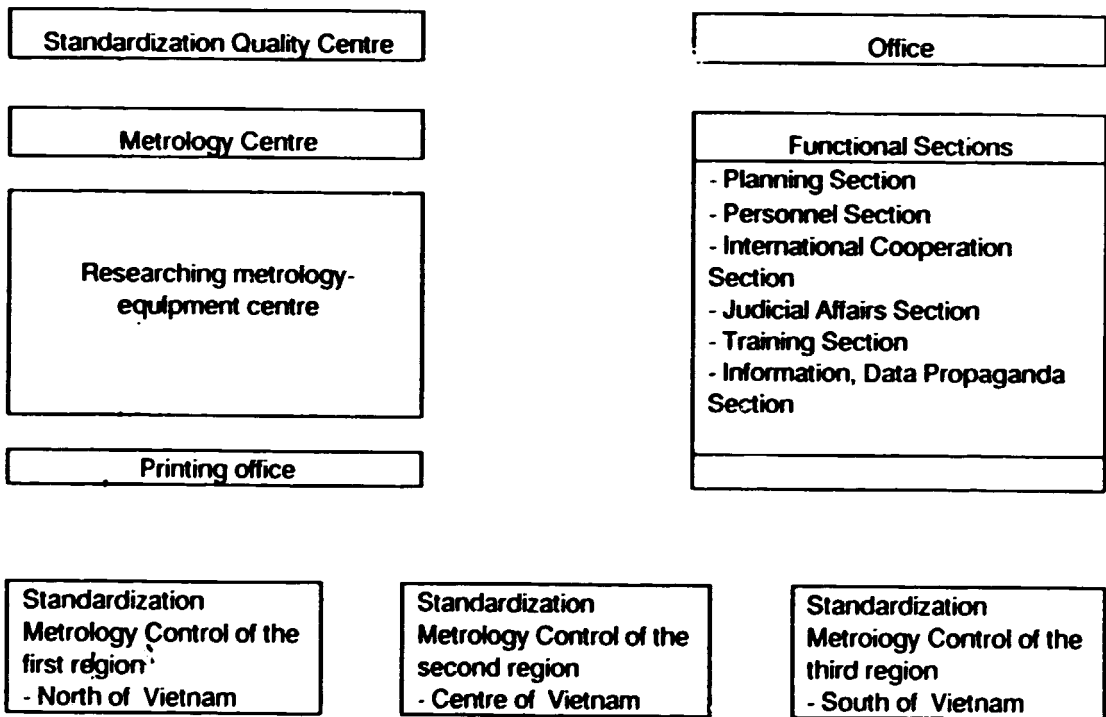
1. Organisational structure of Centre I.
2. Organizational structure of Light Industry Testing Laboratory and the schema of its Services.
3. List of Light Industry Laboratory Test and Measuring Equipment form of record.
4. List of international standards in Laboratory of Centre I.
5. Form of calibration dates.
6. Book for samples.
7. Book for daily use of the testing equipment.
8. Operating instruction for testing procedure.
9. Example in English of the format of the Yearly Maintenance Plan
10. Label referring to calibration.
11. List of products to test.
12. Example of test data content.
13. Staff and assesment of the competence of the staff.
14. Audit plan.

ANNEX 1.

The General Department for Standardization - Metrology - Quality belonging to the State Committee for Science and Technology was created by Decree 22-HDBT dated on 8th February 1984 of the Council of Ministers.

Organisation structure of the General Department

Leadership of the General Department



FUNCTIONS AND TASKS OF GENERAL DEPARTMENT

- To study directions and policy on standardization, metrology, quality management of products and goods and to submit them to the Council of Ministers.
- To study regulations, specifications on managing standardization, metrology, quality management of products and goods and recommend authorities to issue them, to guide, push and supervise the realization of these specifications.
- To organise the formulation or revision of national standards (TCVN), international standards (ISO, CMEA), to give opinions to branches and provinces in formulating and implementing branch standards (TCN), provincial standards (TCV); to organize propaganda, guidance and supervision on implementation of issued national standards.
- To have the custody of national metrology standards, to recognize the legality of metrology standards of lower levels, to verify metrology equipment and apparatus; to examine and permit to produce new metrology equipment and apparatus.
- To organize the inspection, estimation, quality certification of products under the uniform management of State; to decide granting quality State certificate and marks.
- To instruct and guide - on profession and organization - standardization, metrology and quality control of products and goods offices of branches, regions and units.
- To set as arbitrator in the case of disputes on standardization, metrology, quality management of products and goods.
- To organize studies on the theoretical, professional issues of standardization, metrology, quality management of products and goods; to research, manufacture metrology standards, experimental equipment and to determine precision measuring methods.
- To organize training courses on profession and technology for personnel working in the field of standardization, metrology, quality management of products and goods.
- To carry out international cooperation on standardization, metrology, quality management of products and goods in conformity with general specification of the State.

THE RIGHTS OF GENERAL DEPARTMENT

- To issue specifications on profession and technology serving the uniform management of the State on standardization, metrology, quality control of products and goods, and to organize the realization of these specifications.
- To cease temporarily the output factories and distribution of products not conforming to quality specifications; in urgent cases, to cease temporarily the production of products which have to meet severe requirements on quality, technological safety (according to the list laid down by the President of the Council of Ministers), to cease the use of the measuring equipment, apparatus not meeting the specified precision requirements.
- To apply different kinds of penalty and recommend forms to authorities according to actual specifications of the State.
- To unify the guidance on organization, technical profession for standardization, metrology, quality offices of branches, provinces and units.
- To recognize and authorize offices, units of branches, provinces to carry out State verifications on metrology and State supervisions on quality of products and goods, to recognize them as standardization basic units.
- To grant or withdraw State quality certificates and marks, to collect fees on metrology verification and testing quality of products and goods in conformity with specified rules.
- To request production and commercial units and offices concerned with samples of products, goods, metrology equipment and apparatus, different materials and necessary means for the supervision of implementation of standards, for checking metrology situation and quality of products and goods.
- To instruct directly heads of standardization, metrology, quality control of products and goods offices of branches, general departments, provinces, cities belonging directly to the Government and directors of central and regional factories under the uniform management to realize entrusted tasks.
- To give opinions on placing, changing, awarding, penalizing senior officers, working in the field of standardization, metrology, quality control of products and goods of branches, general departments, provinces, cities belonging directly to the Government, central and regional State

factories (according to the list agreed between the General Department and the offices mentioned above).

Address:

General Department for Standardization-Metrology-Quality

70 Tran Hung Dao Str. Ha Noi

Telephone: 56675

ANNEX 2.

Organizational structure of Light Industry Testing Laboratory and the schema of its Services

Testing of products for light industry - Centre I.

The following products and their physical and chemical properties can be evaluated in the laboratory:

- | | | | |
|--|--|--|---|
| <u>Fibre Testing:</u> <ul style="list-style-type: none">- Length of fibre- Tensile strength- Elongation- Crimp- Moisture content | 2. <u>Yarn testing:</u> <ul style="list-style-type: none">- Tensile strength- Evenness- Fineness- Linear density- Twist- Color fastness | 3. <u>Fabric Testing:</u> <ul style="list-style-type: none">- Mass- Tensile load- Elongation- Bursting- Color fastness | 4. <u>Leather:</u> <ul style="list-style-type: none">- Mass- Thickness- Color- Elongation- Elasticity |
| 5 <u>Paper Testing:</u> <ul style="list-style-type: none">- Dimension- Moisture content- Mass- Whiteness- Bending test- Softness- Glossness- Fineness | 6 <u>Rubber testing:</u> <ul style="list-style-type: none">- Tensile strength- Elongation- Deformation- Hardness- Tearing strength- Density- Abrasion resistance- Ageing to heat ...- Compression strength | 7 <u>Paint, lac testing:</u> <ul style="list-style-type: none">- Dry time- Bending strength- Glossness- Thickness- Coverness- Viscosity- Fineness- Falling strength- Abrasion test | |

ANNEX 3
EQUIPMENT RECORD

Name and description of the equipment:

Local identification number:

Manufacturer's name and address:

Identification by type/model and serial number:

Year of manufacture:

Date received and installed:

Current location of the equipment:

Cost of equipment (at the time of purchase):

Documents:

- Main technical parameters:**
- Instruction Manual:**
- Circuit diagram:**
- Calibration and the relevant frequencies:**
- Maintenance Manual:**
- Spare parts list:**

Name, address and phone (fax) of local representative and/or local service company:

ANNEX 4

LIST OF INTERNATIONAL STANDARDS FOR LIGHT INDUSTRY LABORATORY IN CENTRE I.

ISO 920-1976	Determination of the length of single fibre
ISO 1973-1976	Determination of linear density
ISO 5079-1977	Determination of breaking strength and elongation of individual fibres
ISO 13060-1974	Cotton fibres. Determination of breaking tenacity of flat of bundles.
ISO 4912-1981	Evaluation of maturity (Microscopic Method)
ISO 105-A02 1987	A02 Grey Scale for assessing change in colour
A03 1987	A03 Grey Scale for assessing staining
E08 1987	Colour fastness to water: hot water
ASTM D 3106-72	Test for deformation of elastometric yarns
ASTM D 204-75	Sewing yarns
ASTM D 2259-71	Test for shrinkage of yarns in boiling water or dry heat
ASTM D 204-75	
ASTM D 204-75	

ANNEX 5
FORM CALIBRATION DATES

Type of equipment	Date of last calibration	Date of next calibration

ANNEX 5/A
FORMAT OF THE YEARLY MAINTENANCE PLAN

Year:

Dept. of Testing

..... Laboratory

Name & ID No. of Equipment	Location of Equipment	Activities to be carried out	Date of Last Next Maintenance	

ANNEX 6
BOOK FOR SAMPLES

Date of arrival	Sample identification number	Detailed description of testing samples	Quantity of sample	Required properties for analysing	Name of client	Price for test procedure
1	2	3	4	5	6	7

2. Start of bookkeeping since January 1. in increasing way
Type of sample: fibre, fabric and others
3. Inside of samples detailed information about testing material:
For example, yarn: structure content: 51% cotton, 49% PE, TE
4. Textile knitting materials 1.5 m = 1 pcs.
5. Producer/client wants to check the properties, for example:
fabric: tensile strength, bursting strength, thickness, abrasion
6. Factory, research institute, university, commercial company, shop (full name, address, phone, telex, fax).

ANNEX 7

BOOK OF DAILY USE OF THE TESTING EQUIPMENT

Example: for tensile strength tester for single fibre

Type FM-27

Date of testing	Period of operation	Name of the operator	Type and distribution of the sample	Present condition of the testing equipment
1990-01-20	08 up to 12	Mrs. Diep	Fibre, 100% cotton sample No.	Was good during the testing procedure

ANNEX 8
OPERATING INSTRUCTION FOR TESTING PROCEDURE
(example)

1. After preparation of sample according to the testing method
2. Prepare the equipment for the testing accordingly. Requirement of Procedure/Client (Put it on, check the intensity of electrical power).
3. Adjustment procedures (check all necessary indication about the instrument in order to find out whether it is ready for performance of the test).
4. Carry out the testing procedure.
5. Record and analyse testing results.
6. Calculate and analyse the necessary parameters.
7. Prepare the protocol of the testing procedure.

ANNEX 9

FORMAT OF THE YEARLY MAINTENANCE PLAN

Year:

Dept. of Testing

.....

(name of the member of staff of the laboratory, who is responsible for maintenance)

Name & ID No. of Equipment	Location of Equipment	Activities to be carried out	Date of Last Maintenance Next	

ANNEX 10
LABEL REFERRING TO CALIBRATION

Name of the equipment	
Local ID. No.	
Date of Last Calibration	
Next Calibration	

ANNEX 11
LIST OF PRODUCTS TO TEST
Centre I. Hanoi

1. **Fibres:**
 - Acrylic fibre
 - Cotton fibre
 - Polyester fibre
 - Ananas fibre
 - Jute

2. **Yarn and sewing threads:**
 - Grey cotton yarn
 - PE/cotton yarn
 - 100% acrylic yarn
 - 100% polyester yarn
 - Sewing threads
 - Knitting threads

3. **Blankets, fabrics:**
 - knitted fabric
 - woven fabric
 - non-woven fabric

4. **Socks and stockings**

5. **Ready made garment for men and women (shirts, jackets, underwear)**

6. **Carpets from wool, jute**

7. **Floor covering products from natural and synthetic (man made) fibres**

8. **Leather**

ANNEX 12
EXAMPLE OF TEST DATA CONTENT

Code	Sample name Identification	Approved by:	Report mailed on:
Document (ISO, ASTM used for testing procedure)			
Nominal values			
Product description (branch name, specific characteristics etc.)			
Producer		Imported from / Exported	
Specification of			
Sample origin (place of sampling)		Sample total amount (kg, pc etc.) Unit part of sample (dimension)	
Sample identification (sampling code number)			
Reason of testing			
Lot size of samples related kg. etc.			
Information on sample			
Qualification of the tested unit sample		signature of the head of laboratory	
		Date:	
Sample complies with requirement: yes no			

ANNEX 13
COUNTERPART STAFF

Name:	Qualifications:	Designation:
Mrs. Tran Kim Anh	<p>Technical University in Dresden, Germany (5 years), diplomed engineer in textile technology.</p> <p><u>Training:</u></p> <ul style="list-style-type: none"> - 3 months of UNIDO fellowship in Germany: <ul style="list-style-type: none"> + Gera: textile testing methods for chemical, fibres, yarns, fabrics + Zihau: laboratory for cotton textile fabrics + K.M.S.: socks + Schwaza: for synthetic fibres - 1 year in textile factory: (spinning, weaving, finishing), special - fellowship in the frame Vietnam-DDR 14 months in Textile Research Institute in Krefeld, Aachen, Hohenstein: <ul style="list-style-type: none"> + carpet wool production, analysing comfort, properties of textiles 	Head of Laboratory Manager for testing textile products
Mrs. Pham Thi Thuy	<p>Technical University in Lodz-Poland (5 years), diplomed engineer in chemical technology for textile products</p> <p><u>Training:</u></p> <ul style="list-style-type: none"> - 2 months UNIDO fellowship in British Textile Technology Group in Manchester, England: <ul style="list-style-type: none"> + fibre, yarns, fabrics testing + seminars about: "Introduction to textile", "Man-made fibre", "Cloth analysis and testing", "Identification of fibre". 	Deputy Head of Laboratory for Chemical Testing of textile and paper products.
Mrs. Tran Thi Van	<p>Mendeleyev University in Moscow - Soviet Union (5 years), diplomed engineer in chemical technology.</p> <p><u>Training:</u></p> <ul style="list-style-type: none"> - 6 months in Committee of Standardization in Moscow 	Quality manager for testing of rubber products
Mrs. Tran Thi Diep	<p>Technical School fo Textiles</p> <p><u>Training:</u></p> <ul style="list-style-type: none"> - in China, Soviet Union for fibre testing 	Head of technicians Senior laboratory technician
Mr. Le Ngoc Minh	<p>Technical School for Electronics</p> <p><u>Training:</u></p> <ul style="list-style-type: none"> - in Centre I. 	Senior laboratory technician
Ms. Nguyen Lan Anh	Training in Centre I.	Laboratory technician
Mrs. Dao Thi Mai	Training in Centre I.	Laboratory technician

ANNEX 14
AUDIT PLAN

Activities to be audited	Basis for audit	Date of performing the audit	Conclusions and recommendations
1	2	3	4

Things to know when planning/using computer applications:

(An abstract of the internal seminar held by the expert for the employees of the L.I. Laboratory of Centre I. in Hanoi.)

According to recommendations given the staff of L.I. Laboratory are expected to have a computer system for improvement of their internal administrative procedures and also for support of a formal system of accreditation. In order to prepare these newcomers in the field of computerisation a training seminar was prepared and held on premises of the laboratory. Here a comprehensive abstract of the subjects discussed is given, especially describing the basic terminology used in connection with computers.

1. Lecture on Computing Technology

First bits, bytes, binary codes and machine words are discussed, as the basic concepts forming the hardware architectures of the computers. Then discussion turns on to the questions of system software that makes the bare hardware into a usable computer system. Next application software is discussed that delivers the real value of those computer systems to their users. Finally strategic questions of how to develop computer applications closes this brief discussion.

1.1 Bits, Bytes, Binary Codes and Machine Words, forming the basis of hardware architectures

Computers use electronic switches to do much the same thing as a Morse code. When you type an alphanumeric character (a letter or a number) it is converted into binary code.

Binary code: It is the code your computer uses to process information. Binary means two. Computers use just two electronic signals to do all their work. In other words, each typed character is converted to a **series** of ones and zeros. The ones and zeros represent Off and On, Yes or No, True or False, or simply nothing or one.

No matter how much information you are processing, your computer is either turning a bit "on" or "off". This is what makes your computer able to process the information efficiently.

Bits and bytes: What is the magic way is the way your computer uses the "on" and "off" switches to process information. The smallest unit in your computer is called a "bit". The easiest way to explain this is to look at another type of machine that also processed data for us - the Telex machine.

The Telex tape has seven holes accross the width of the paper. Sometimes all seven holes are punched out. Other times, a combination of holes and spaces appear. Each different combination forms a "word". For example, if you hold the tape in front of you and "read" from left to right you might see two holes punched out at the top of the tape. These could be used to represent the letter "A". When the tape goes through the Telex reader, small pins under the tape push up. If they go through the two holes, a signal showing two "on" and five "off" switches is sent to the printer and it prints the letter "A".

One hole in the Telex tape could theoretically be called a bit. The seven holes could also, for the purposes of this explanation, be thought of roughly the same as a computer "**byte**". Computers are a little different, of course. Instead of seven "holes", computers use a series of eight bits, or electronic switches, to form a byte.

To simplify this, a bit is one unit of an electronic signal the computer uses to store and process information. In fact a bit on its own is useless. When eight bits are combined they form a byte. A **byte** can then be **used to store or process information**, including forming letters and numbers. Bytes are in fact the basic entities in computer operations. How this organization is done on bytes? Let us explain.

With eight bits forming a byte, we can switch each bit either "on" or "off". This means we can set two to the eighth power (2^8) different combinations. This gives us 256 different possible values in each byte.

We refer to bits by numbering them from right to left (strange, but true). The bit on the right is called the Least Significant Bit (LSB). And consequently the bit on the left is called the Most Significant Bit (MSB).

This distinction is an important one. Because each bit represents a power of two value, we can give all eight bits a numeric value, according to the following chart

(do not forget meanwhile that whenever you start counting in computerland, you always start at zero):

ONE BYTE:	
Bit Number	Numeric Value
76543210 < —	
.....1 LSB	1
.....1...	2
.....1.....	4
.....1.....	8
.....1.....	16
....1.....	32
...1.....	64
MSB 1.....	128

Using this chart as a guide, we can see that bit 3 has a numeric value of 4, and bit 7 weighs in at 128. Thus the number 131 could be represented inside the computer by turning bits 3 and 7 "on", while other bits are turned "off" ($4 + 128 = 131$). Similarly any alphanumeric character may be represented by a distinctive alphanumeric code. If the codes are standardized, meaning all computers interpret the numeric value of the code in the same way, then computers are able to exchange information.

Code ASCII (American Standard Code for Information Interchange) has been developed exactly for that purpose. In it the code value of 20 for example represents letter "A". Bits 2 and 4 are turned "on" while the others are remaining turned "off" ($20 = 4 + 16$). Just as in the case of the Telex machine.

Code ASCII (and its recent derivatives) are used to represent the information externally, on the **data input/output devices**, such as keyboards, visual display units (or monitors), printers etc. For internal representation of the information computers use also a much more efficient representation, when a group of bytes is used to represent integer or real values.

By grouping two bytes together one may get the simplest unit by which a number of computers may process numeric information internally. For this, understandably simplest class of machines, these two bytes form a machine word. Such computers carry out their basic operations on one or two words as operands, and deliver their results in a single word. To identify these units as

words is quite understandable. Computers "express" themselves by these words just as people express themselves by words in ordinary sense.

By having two bytes in that word those computer's operations are much more meaningful than operations on just single bytes. Two bytes, for example, may represent integer values between 0 and 65535, enough for the simplest calculations, and there is also a signed interpretation of those two bytes contents which allows integer values between -32536 and +32535 to be represented exactly for calculations.

Having two bytes grouped together as the basic unit of their operations classifies this kind of computers as well. They are simply called 16-bit machines. Not all computers have, however, word size of just two bytes. Computers able to operate with words formed of four bytes, and subsequently called 32-bit machines, are generally more powerful and have much more potential.

Doing operations on four bytes instead of two is indeed more powerful, since calculations with integer values of higher precision (with greater than five number of significant digits otherwise) may be carried out in much smaller number of operations. Their greater potential is expressed by the fact that they are able to address much bigger chunks of their memories. No surprise in that, since the **memory** itself is typically addressed through word-sized units during the operations.

For computers with word size of four bytes it means the potential ability to individually distinguish between up to 4.294.967.296, i.e. more than four million bytes of memory forming individually or in groups the cells where the information is stored during the operations. This kind of so called **operating memory** could have huge capacity indeed, and this is very much reflected in computational abilities of those computers as well!

The reason for this is quite simple. Computers operate on so called stored program principle. This means that not only the information processed, but the program of the operations to be carried out is also stored in the memory. Such a program gives instructions to the so called **processor** of the computer, and when programs could be bigger (along with the size of the processed information), so is the processing ability of that computer gets bigger.

In other words, a 32-bit machine is much more **software** capable, than a 16-bit one. Software is the generic name for all program products that make a computer to work. The electronic circuitry on which all computer operations are based, including that of the memory and processor, is just bare **hardware**, that is little value to the user. What delivers the real application value is the software written for that hardware. And 32 bit machines have by orders of magnitude greater potential for software than 16 bit ones could have at all.

1.2 System Software

The world of software is much like a universe in itself. First there are a number of **system programs** that transform the bare hardware of the computer into a system that could be used as a general computing device and operated by human personnel.

Some system programs help programmers in making software development in an efficient way, by today's reality of 32 bit machines in wide spectrum of hardware, from desktop to the computer centers, indeed possible. Think only about the extremely huge amount of both information and instructions that such a computers could easily handle! Other system programs are rather extensions to the original hardware that help to build much more complex (than that hardware itself) computing systems, and at the same time (not a paradox !) to make them easier to operate.

As far as the system programs of the first aspect are concerned, it is worth to note that no software development (or more precisely just a negligibly small portion of it) is done today directly on the level of the binary code which operates all the computer hardware. Instead numerous high-level programming languages are available that aid in expression of the operating instructions and the information to be handled by them in a form of high-level statements operating on highly structured information.

These high-level programs look nowadays quite similar to specially organised texts that are easy to interpret by human beings (however professional education is required to compose such texts). There are special programs, so called language compilers, that are able to translate these high-level descriptions into the language of the binary machine codes, and also to compile from that code a program that is possible to run on a computer.

A number of other system programs aid programmers in software development. Most often used programming procedures, some of them even standardized, are kept and maintained by special librarian programs. To link separate pieces of a program developed by several programmers, or at different times by the same one, is possible to do with special linkage editor programs. And these are just a few of these class of programs.

In fact whole software engineering systems are available now, that contain vast amount of programs readily available for software development. The era of reusable software components is very much with us, helping professional software engineers to build software-based systems of immense complexity, in-time and (almost) on schedule. The other class of modern system programs, being immensely complex in their internal structures and operations, indeed would not have been possible without such software tools and components.

The most important system program in the second aspect of making the hardware usable, is the so called operating system. Its main function is to control all the operations of the computer. As part of that function there is an interface to the operator. In this way the computer is operated by the operating system on behalf of its operator who is giving his/her commands using that interface.

In modern world of computer systems there are a number of other system programs of this kind as well. Network operating systems, for example, are a special class of operating systems that are written not for a single computer but for a whole network of them. Their control functions are much more numerous than that of their simpler brothers. They are able, for example, automatically handle transmissions over quite different communication media, from high-speed coaxial cables operated locally to the most sophisticated long-distance telephone lines incorporated into the system.

Another important class of the second kind of system software is the class of database management systems. Their tasks include all the control of the most sophisticatedly organised data stores of computer systems. They present all **external data storage** devices (different kinds of disks: magnetic of winchester kind and floppy kind, optical ones etc.) in a form usable for reflecting the relevant facts of the real world in the computer system. They also manage the set of

geographically distant storage devices when the computer system is not a simple local device, but rather a dynamically changing network of such devices.

Finally (but not exhaustively) there are graphical user interface programs (GUIs) as the class of system software which presents the whole computer system to its user as a world of graphically distinguishable objects that could be manipulated directly by interfaces built on point-and-see principles. Not surprisingly some of these programs are incorporated into operating systems themselves.

A computer system presented as a universe of artificial reality, a kind of dynamic information media should be controlled by an operating system that incorporates the GUI itself. So is the case with network operating systems and database management systems. The ultimate computer system is represented by the combination of all these system software. This is the way things are moving. This is the real world of computers to come!

1.3 Application Software

After a glimpse into the (near) future let us look into the realm of **application programs**. These are the real inhabitants of the software universe. They are indeed numerous! One class of them even exhibits certain system-like traits. Generic is the category of the application software which presents the computer system in a form generally suitable (from user point of view!) for a certain, sufficiently general kind of information processing.

Word processors, for example, are able to process and present to the user any word-based (word - in ordinary sense) information. Any kind of textual document, consisting of sentences, paragraphs, embedded tables and figures, and having many levels of sections, together with contents, different kinds of indexes, and all this properly arranged on physical pages of desired size (with all footnotes, headers and footers certainly) — this is the realm of word processors.

Their close cousins are the so called desktop publishing software products. They are much more sophisticated in handling documents, since for them the aesthetically pleasing and typographically right physical appearance of textual documents is much more important than the textual and illustrative expression of the original idea, that led to the given content. Therefore these software products are quite good in handling typographic properties such as kerning, leading,

framing etc. They are also very capable of incorporating high-quality illustrations such as photos, artist's sketches etc. Naturally, they should communicate with word processors and other generic application programs to do their job.

Another kind of generic class of software is the electronic spreadsheet. Its world is restricted to a freely definable table (or sp called worksheet) of dynamic computing cells that could spread to quite significant sizes (e.g. 16.384 rows by 256 columns). Each cell may either contain a value entered by input, following a direct selection on the screen, or its value may be computed by a formula, attached previously to that cell, from contents of the other cells.

Furthermore any subset of the cells may be mapped to the kind of diagrams used in business graphics (pie-charts, column-charts etc.), for better understanding of the results calculated. Some spreadsheet products have also succeeded in making very good connections to some high-level database management systems.

In the world of spreadsheets one may build quite sophisticated applications without real training in programming and software engineering. Moreover there is the inherent potential to build quite unusual problem solvers where the predetermined way of calculation by the program entered into the spreadsheet (the so called algorithm) is combined by power of heuristical problem solving of the operator him/herself. By observing the results of the actual calculation, the operator may alter certain program settings until he/she achieves the desired result. This, so called "what if" style of problem solving, as a synergy between the human intellect and the computer, is the most powerful feature of spreadsheet-based application systems.

Some, and lately most, of the database management systems have grown up into the realm of generic application software. A user may access information managed by these systems through so called 4th generation languages. 4th generation means that the time when only professional programmers could formulate the end-user demands by high-level languages suitable only to them (so called 3d generation) is gone. Now end-users themselves may sit at their workstations, define their information requests in an almost natural-like language interface. and watch for the results.

4th generation languages represent quite a revolution in computing. While the development of the programs for creating, displaying and printing of primary documents of a business is a well defined activity which leads to a few programs (and thus best done by professional programmers), development of information retrieval (so called query) programs is quite different in that respect. Even for modest databases the number of possible information requests is quite big, so is the number of programs to be written.

Moreover, as the complexity of the databases grows (i.e. more categories, each with more facts are to be contained in the database), the number of possible information retrieval programs grows even faster. By having a real end-user tool, like the 4th generation languages, software manufacturers were able to come out of dilemma. A single program could become a substitute for myriad ones.

Quite different from the generic ones are the application programs that are more application specific, but nevertheless could be used accross a whole horizon of computer applications. These, so called horizontal application software organize for the users their accounting (financial, managerial etc.), aid in their control of industrial production, help to coordinate sales and marketing activities, provide powerful modelling facilities in the field of research and development, support executives in their work etc.

They are distinguished according to the jobs they are aimed at. Therefore we speak of accounting software, production control software, sales and marketing support software, research and development support software, executive support software etc.

There are other application programs that may be called vertical. They are aimed at specific sectors of mankind activity. Different sets of programs are offered for example to manufacturing companies with discrete processes (automobiles, aircrafts, computer hardware products, telecommunication equipment etc.) than to those with continuous ones (different kinds of chemicals, petroleum products, pharmaceuticals etc.). The sets may be even more distinct when more product, market and company-size considerations are taken into account (automobiles as opposed to aircrafts, luxury cars as opposed to mass-produced, serial ones etc.).

1.4 Strategic Questions of Developing Computer Applications

Complex solutions incorporating more and more horizontal applications, but carefully adopted (or adaptable) to sector-specific and local circumstances it is therefore the way software industry is going to satisfy the growing demand in software of vertical kind. Understandably so, since we are talking about the most complex products engineered throughout the history of mankind.

Meanwhile, as a transitional state, the vertical software offerings tend to be rather segmented, targeted toward sometimes rather small niches, and in some cases represent an island quite remote and isolated from the mainstream developments. Do not forget that we are still living in a world where a lot of so-called in-house development (done by the users themselves or their closely related, satellite software companies) dominates the scene!

Looking into the future we may establish that it is quite important to distinguish between the computer application systems developed for different sizes of organizations. While the most complex computer systems, covering large organizations with rather diverse activities, will and indeed should be developed with direct involvement of professional software development organizations (both in-house and external), systems for smaller and more flexibly changing organizations are better built by users themselves.

For the systems of first kind professional software engineering systems, and software developed to exact user requirements play a more important role than the adaptation and integration of the generic software packages, horizontal and vertical applications purchased on the software market. At the same time for a small organization buying, adopting and integrating generally available software packages could be the best way to go.

Indeed for an individual working alone, or a small group of targeted to a specific job employees a personal computer, or a network of personal computers equipped with the best of generic packages may constitute the best computing environment in which the end-users themselves (after some general, but mostly self-education) could build computer systems that meet their exact needs best. This is very much the case of the L.I. Laboratory, **therefore recommendation for the best personal computer in that respect, Apple's Macintosh was made by the expert.**

2. Lecture on Printing Technologies

Since the preparation of printed documents and reports is very much in the focus of attention for the computerisation of the L.I. Laboratory expert delivered a special lecture devoted to the printing devices used in conjunction with computers.

There are numerous printing technologies used in computer systems:

2.1. Dot matrix printers represent the most widely used devices at the moment.

They are printing by the means of wires moving in the holes of a specially designed head. The head assembly (together with the electromagnetically operated wires in it) travels at regular pace before a ribbon (that has the ink absorbed in a typically nylon material). When a wire hits the ribbon the latter comes into contact with the paper and a dot is typed in the actual position.

Even the simplest dot matrix printers employ heads with 9 pins vertically. By operating the required parallel wires simultaneously, at the same time a number of dots can be formed vertically on the paper. In the next interval, when the head travels one dot position further horizontally the wires are operated again (those that should be operated, if any) and in this way additional dots are left on the paper, and the actual character gets more formed etc.

Near letter quality (NLQ) printing could be achieved by dot-matrix technology by two methods. In one the similar head assembly is used but it is operated differently. Usually the wires are operated at half of the distance along their horizontal travel, and in addition the same line is printed once again but with head-assembly lifted a half-dot up vertically. In this way much more solid trace is left on the paper and the quality of printing will approach that of the impact printers using solidly formed printing heads (such as the distinct heads of traditional typewriters). The price paid however for such a functionality is usually the much lower speed of printing.

Another method of near-letter-quality printing used in dot- matrix technology is based on increasing the number of vertically available printing wires. Today's dot matrix printers of this type typically use 24 wires instead of just 9. In this way it is

not necessary to repeat the pass by moving the head assembly half dot up, but in single pass the printer could leave nicely formed dot columns on the paper.

At the same, time however, in near letter quality mode these printers still work slower (but not so much as the 9-pin ones), since their next printing position is still at half-dot distance from the present one. However their quality of printing in the draft mode is much better than of the 9-pin ones, since much more pins are used to form the dots vertically.

2.2 Letter Quality (LQ) Printers

To get real letter quality printing one needs a printing mechanism that operates with solidly formed characters. Traditional typewriters represent such a mechanism, but in order to satisfy demand for higher speed printing new methods were developed for LQ printers used in computing systems.

IBM's ball printer technology was one of the first ones. Originally developed for typewriters it quickly came to use in IBM's own computer systems. This technology uses a specially designed ball, on the surface of which the solid characters are formed. The ball moves horizontally along the paper and when the appropriate position is reached it hits the ribbon simultaneously managing to turn into the strike-out position the character that should be printed at that position. For that the printing ball makes quite sophisticated "dancing" movements ("turn and bow" etc.) and it is controlled by equally sophisticated electronics. Due to the proprietary nature of this technology it has been not used outside IBM's own computers.

For other computer manufacturers daisywheel technology came to the rescue. As its name suggests the printing head in this technology is organised as a wheel with radially spread-out character arms, just like a daisy (the flower). This wheel is turning around by a regular speed and its character arms are operated according to the character to be printed by the means of electromechanical plunge hitting on them from behind.

This technology has been quite widely used in the last decade whenever real letter-quality printing was required inspite of its quite noisiness. In the 90s however it is going to be replaced by dot based technologies of greater resolution, such as the latest class of NLQ dot matrix printers able to achieve at

least 180 dot per inch (dpi) resolution, or even more by ink jet printers and laser printers of even higher resolution.

2.3 Ink Jet Printers

Ink jet printers represent a very special and quite sensitive to the quality of manufacturing technology kind of devices. No wonder that only the best electromechanical device manufacturers, such as Hewlett-Packard (by far is the leading manufacturer in the field) and Canon were able to introduce regular and relatively successful offerings to the special market of these printers.

For an inkjet to operate flawlessly the printing head should be manufactured by utmost care and precision, special kind of ink should be developed that is not dried up in the extremely narrow capillaries of the printing nozzles and so on. (Do not forget also that to control the operations of such a printing head is a feat in itself).

Ink jet printers are unique at the moment that they are able to print in real colors (not just the "near colored" capabilities of the matrix printers equipped with multicolor ribbons). Because the recently introduced color laser printers are quite expensive yet, ink jets will remain the only affordable color printers for most users for quite a some time. They are also extremely quiet which makes them suitable to replace NLQ matrix printers wherever quietness is an important consideration. (Latest class of extremely low-priced, \$1000 laser printers will however replace them in that capacity quite soon.)

Ink jet printers have certain disadvantages as well. They are using water based inks. Therefore if the printed page gets wet the ink on the paper will run or smudge.

2.4 Laser Printers

They work from a beam that takes the information from computer. The words typed in are translated by the computer and the printer itself (connected to the computer) into a series of electrically charged dots on a rotating cylindrical drum. This drum has been coated with light-sensitive electrostatic material, and the charges thus could be put on the drum by the laser beam of the printer.

An image which is placed in this way on the drum (with laser dots) will attract charged toner to the dots that have been placed there and repel it from areas where the laser beam has not touched the drum. This image, created in ink toner, can then be pressed on to the paper and the paper can then be ironed to set the dots.

For this process the laser printer consists of three basic parts:

- the image conversion section
- the laser scanner
- and the electrographic printer.

The information to be printed is transmitted from the computer to the image conversion section in a digital form (as series of "on"-s or "off"-s again). To produce that image however quite powerful, more than 16 bit (such as those equipped with Intel 80286 processors) or real 32 bit (such as those equipped with Intel 80386 and 80486 processors) computers are required. Fortunately most PCs of today's market are able to meet this requirement, so even individuals with tight budgets (since PCs in question could be acquired for just above the \$1,500 mark in retail) could exploit this latest printing technology.

The effect of laser printers on the progress of whole computer technology is therefore quite significant. First, these are the first printers that produce very high quality output, with resolution of 300 dpi and more. Second, they are also the first ones in being extremely quiet. They are much more quiet in fact than modern copier devices used in offices everywhere. No wonder, since they need just one mechanical movement for their operations, the transport of the paper on which the image is set.

By having resolution of 300 dpi and more, with precisely formed dots on the paper, quality gets close to typeset quality. Not even LQ printers approach that quality since their solidly formed characters cannot leave such a precise trace on the paper (because of the mechanical movements and of the ribbon between the printing head and the paper) as the highly precise laser-beam can on the drum. And it is certainly much better than the NLQ quality that can be achieved by matrix printing. It is better called NTQ - Near Typesetting Quality.

2.5 What-You-See-Is-What-You-Get — even on the paper!

To appreciate the full significance of laser printers for the whole computer revolution we should speak of another principle strongly followed in state-of-the-art computer systems accessible by the means of graphical user interfaces. In these environments users do not simply follow point-and-see interactions with their computers, not even are carrying out their manipulations in a direct way (i.e. selecting by pointing and then acting on things selected), but much more. No action on user's part may cause an effect that remains invisible to him/her.

This principle, which is rightly called:

What-You-See-Is-What-You-Get, or WYSIWYG for short reflects the essential of the new computing environment established around us as users. Its significance could not be stressed enough since this is the only way how a user could avoid his/her uneasiness about the computers. Even highly trained computer professional are tired off the command language interfaces to their computers, since when using those commands (interactively) they could — sometimes, at least when tired — make significant mistakes, that remain uncovered for them, with all unpleasant consequences. Then what expect of the end-users themselves, sometimes called naive, and quite understandably!

Laser printers make no less than allowing complete conformance to the WYSIWYG principle in state-of-the-art systems. By introducing them:

- WYSIWYG could be realised not just in terms of the computer screen but also on hardcopy when required
- **The universe of artificial reality, created by the software becomes an almost real universe. Real in the sense that its true "face" could be captured in hardcopy documents produced by the laser printer, in all necessary details required.**
- Thus laser printing technology completes this latest milestone in the development of computing technology. **It does the same as Guttenberg's printing machine did for the written word. It allows the distribution of information created in this way to everybody. Even to those who do not own any computers at all!**

3. Lecture on the installation of a computer system

For a small organisation like the L.I. Laboratory of Centre I. a personal computer system equipped with suitable generic software could do the job quite well. As the adaptation of the software to immediate needs is the task of the users themselves, thus the installation of the system itself should, and indeed could be carried out by them. To aid the staff in that respect expert delivered a lecture devoted to only this subject.

3.1 A general approach:

First the system manual supplied with each system should be read. Since such a manual is written for easy orientation in a later section the most popular system of MS-DOS computers (also called IBM compatible PCs) is presented through its basic concepts. It is assumed that familiarity with that system will help anybody to take the first steps in understanding the installation and operation-specific properties of computers.

Other systems are based on quite similar concepts, although their appearance may be quite different at first glance. Familiarity with the manufacturer supplied system manual will very soon reveal, however, that the system to be introduced and operated is based on quite similar concepts. This is also the case of the Apple Macintosh computer, recommended for purchase and installation at the L.I. Laboratory of Centre I. So study its system manual before its installation!

3.2 The system manual

The system is supplied with a manual that introduces you to the operating system and teaches you how to use different features of it.

You can learn:

- About your keyboard
- About disks and files on them
- How to start a computing activity
- How to use system commands
- How to print a file
- How to run a computer program
- How to create a computer file

- About the terminology used throughout the manual and in computing general.

3.3 important definitions, necessary for the reading of the system manual

(on the example of the most widespread, MS-DOS operating system for the IBM compatible personal computers)

When you start to use a computer, you must often learn a new set of words:

Programs: - often called Application Programs or Application Software. They are closely related series of computer instructions and their related information, that are stored in special computer files, and once loaded into the memory of the computer could be run in order to perform a certain, application specific task. For example a program might tell your computer to alphabetically sort a list of names.

File: - it is a collection of related information. Usual file folders, found everywhere in offices, for instance might contain business letters, office memos or monthly data of test procedures.

Files organised on your disks could also contain letters, memo and data. Just as each folder in a filing cabinet has a label, similarly a computer file on a disk has a name. A file name can be formed from at least up to eight characters depending on the type of the computer and its operating system.

Directory: - it is a table of content for your disks. It contains the names of your files, their sizes and dates they were modified. Directories in some operating systems are organised in a hierarchical way meaning that every directory may contain not only files but other directories as well. In this way computer files could be stored in a highly organised way impossible (practically) for traditional file folders in offices.

Volume Label:

When you use a new disk, you can also give each of your disks an internal name, called a volume label. Make always sure that you label in your disks. It is the only way you can distinguish them from one another if you are not going to look into their contents.

Disk Driver:

Drives are the hardware units that make the disks operational and accessible from their computers. Floppy disk drives are commonly referred as the A: or the B: drive in the system, while hard disks as the C: or D: drives. When accessing the drives make sure that you are referring to the correct one, otherwise you may get an error message from the operating system that the referred drive is inaccessible at the moment.

Drive Name: - one letter identifier of the drive followed by a colon character, such as A: , B: , C: or D: . When using an operating system command with reference to a file, you may sometimes type in the drive name before the name of referred file.

Command:

Just as you will run programs to create and update files containing your data you will need to run some special programs called command files that let you manipulate entire files (and do other general operator actions as well).

When you give the operating system certain commands you are asking the computer controlled by that system to perform certain tasks on your behalf.

Commands such as:

- compare, copy, display, delete, rename files
- copy, format and label disks
- list directories
- enter the date and time

mean what they are meant to do.

Special meanings keys:

In addition to the keys you may found in a typewriter your computer keyboard has some special meaning to the operating system, such as:

- move the cursor (a special indication of the position of the screen affected by your typing actions) in different directions (left, right and up, down, as well as to home and to the end)
- return to the beginning of the next line, used for signalisation of the end of your commands to the operating system
- etc.

Floppy disk:

It is a magnetized disk of removable type that can store up to 400 single-spaced pages of text. You should always put a label on front of the cover at the top, so that the label does not touch the magnetic surface of the disk. You should remember when writing on that label that pencil or ballpoint can damage the disk if you press it hard. It is also important to note that floppy disks should be stored in a safe place (away from dust, moisture, magnetism and extreme temperature).

Disk protection:

Labels do help you keep track of your disks. When however more discipline should be imposed on access to them the additional feature of disk protection may come into effect. Many application programs, for example, come on write protected disks that protect the computer files stored on such disks from being destroyed accidentally.

Hard disk:

In addition to floppy disks modern computers need hard disks for their operations. These kind of disks are permanently built into their drives, and totally sealed off their environments. As a result of this they may contain much more information than their floppy counterparts, and access to the information stored on them is much faster as well.

Today's hard disks have about 100 times more storage capacity than the floppies, and about 10 times shorter access times. Some hard disks may achieve even 1000 times more capacity and even greater than 10 times shorter access time. However they are not exchangeable which makes them no substitute for floppies. Each kind of disk has its own function in the computer system. Floppies are used to store a lot of exchangeable information that is not required on-line all the time, while hard disks are stores for long-term data and information in the computer.

Training Course

A 5-day training course for testing quality of cotton fibre was organised for the staff of laboratory between 14th and 18th of January 1991.

Introduction

Quality control of raw fibre for proper running of spinning factories is extremely important. The reasoning behind of it is the following:

- sixty to eighty percent of finished product cost goes to purchase of raw fibre
- the raw fibre is the most expensive factor in producing yarn.

The Light Industry laboratory has to assist the fibre industry to carry out all necessary tests for checking the quality of fibre. If the L.I. laboratory can supply exact characteristics of the raw fibre correctly, then consistent and homogenous blends may be fed into spinning machinery, and before starting of the blending procedure, after quick and reliable service from the laboratory, the bales can be chosen for mixing procedure. The L.I. laboratory by the way of its quick and proper services will be able to prevent costly disruptions in the mills, to maintain mill production schedules AND

**PRODUCE THE HIGHEST QUALITY OF YARN FROM THE LOWEST RAW FIBRE COST !
THESE ARE ALL IMPORTANT CONSIDERATIONS !**

In countries with not so effective market possibilities as Vietnam large amounts of raw fibre are usually purchased. Even from regular suppliers the quality of supply can vary year after year, that makes difficult to achieve a regular, steady mix of the INPUT FIBRE. Therefore the main reasons to give a high priority to regular testing of quality control at factories are (with very high degree of service availability, i.e. delivering test results quickly):

- choosing bales for a mix from an informed perspective
- TO ACHIEVE REGULAR, steady production processes
- TO ACHIEVE REGULAR, steady quality of the finished products.

The laboratory has the following equipment for testing fibre quality:

By the application of the system of quality control with testing instruments the L.I. laboratory helps spinning factories:

- to achieve regular, steady production processes
- and also regular, steady quality of the finished products.

Advances in the instrumentation of the testing procedures can offer spinning factories and purchasers of fibres:

- precise and reliable test mechanism
- automated operation procedures
- graphic capabilities
- diagnostics of the quality

The laboratory's activities in this field can assist purchasers and the spinning factories (by their mutual collaboration)

to establish PURCHASE PRICE defined by REGULAR and RELIABLE quality.

Warehousing and decisions on MIX CHOOSING could be also made properly in this case.

The properties of cotton fibres that can be checked and analysed in the L.I. laboratory are the following:

Known physical properties of cotton fibres:

- length of fibres
- linear density (fineness)

Known mechanical properties of cotton fibres:

- strength
- elongation
- maturity

These known properties will influence most of the working usage capacities, such as:

- stimulates the arrangement of fibres in the draft zones
- measures the actual fibre length which extends to drafting

This kind of information may thus guide the spinners in adjusting:

- draw frame
- card
- and comber

machinery settings.

The ultimate result such a fine adjustment may achieve is:

- INCREASE OPERATING EFFICIENCY
- and PROVIDE PREDICTABLE YARN QUALITY for open-end spinning machinery and for the ring spinning machinery.

High-volume instruments (HVI) for fiber testing

- ° the properties of the raw cotton fiber influence:
 - the manufacturing process to be used
 - and the quality/usability of the manufactured goods
- ° known physical properties of the cotton fiber:
 - length
 - linear density (fineness)
 - micronaire (which is a complex measure of fineness and maturity)
- ° known mechanical properties of the cotton fiber:
 - strength
 - elongation
 - maturity

(these known properties will influence most the working/usage capacities of the products from the fibres)

- ° cotton bales purchased on the international market are qualified for the manufacturers:
 - ° by a complex code assigned to the given item during the qualification process;
 - ° this code indicates the quality class of the raw fiber
 - ° and it is a composite measure of shine, color, appearance, trash and maturity
- ° traditionally (introduced more than 150 years ago in England) subjective measurements were used that are:
 - using the organs of sensitivity as "measurement instruments"
 - and compare the sample to internationally accepted etalons (grade standards etc.)
- ° not so long ago (appr. 50 years back in Soviet Union) objective measurements were introduced that are:
 - based on instruments of measurement for parameters defined by standards
 - and compare the obtained results to indicators determined by the technologies

However:

- ~~all~~ these systems are based on some representative samples and require sufficient number of people with enough experience
- and the latter objective systems of classification were limited (UNTIL NOW) by NOT

enough accuracy, efficiency and practicality of the test instruments themselves

Advances (during the 80s) in mechanical engineering, instrumentation and computer technologies made possible to introduce High Volume Fiber Test Systems that offer:

- precise and reliable test mechanisms
- automated operation procedures
- graphic capabilities
- flexibility in measurement units and test parameters
- computer controlled calibration and diagnostics
- and user-friendly software programs.

The results were astonishing:

- the US Department of Agriculture (USDA) in 1984 installed thirty Spinlab HVI 900 systems in four locations where instruments were used to classify appr. 4.6 million bales of cotton; a year later three additional testing locations were added to the sites where the 900 System used exclusively for the classification purposes
- cited reasons for the system's use include:
 - ° its increased speed in testing large numbers of bales (as many as 180 bales can be tested per hour)
 - ° reduced variation in classification (due to the possibility of testing each bale)
 - ° and a reduction in the number of highly trained operators needed to classify bales (the entire system requires only two operators for all necessary tasks - from ID entry to sample disposal)
- in Hungary the same equipment (Spinlab HVI 900) was installed by a large-scale manufacturer (Masterfil), and the duration of the classification relative to the traditionally organised testing laboratories has been decreased by 200 times!

So let's consider the Spinlab HVI 900 in order to have a clear understanding of this kind of systems:

° Spinlab HVI 900 consists of three main parts:

1. Controller:

- an IBM PS/2 central unit (microcomputer to run the software and store the results on a built-in magnetic disk)
- a monitor (to show the test results and serve as a communication display device between the operator and the controller)
- and a printer (to prepare the printed report)
- + control software (to determine which test results need to be collected and how these results should be stored for review and interpretation)

- ° the choices for selection are shown on menu displayed
 - ° test and calibration parameters
 - ° the combinations for testing
 - ° the type of fiber
 - ° and the method of registration of the resultsare selectable
- ° the software is capable of operating with other software products and can generate data files for highly popular PC spreadsheet program Lotus 1-2-3 (the later allows easy postprocessing of the results by the user himself)

z. The right console which has the:

- ° Trashmeter 935 for determining the nonfiber or nonlint content of the cotton (leaf particles, stems, bark, whole or parts of seeds, motes, grass, and dust) (Because cotton is no longer cleanly picked from the plant by hand but harvested with strippers and spindle harvesters, the amount of foreign matter in cotton has drastically increased. At the same time factories must cope with the problem of variable and increasing trash being fed into production machinery of ever increasing speed and sophistication. This sensitive machinery demands super-clean cotton for efficient operation. Since a mill's

- opening
- cleaning
- and carding

processes cannot solve the **problem of variation**, a mill must gain control over variable trash content through:

- purchasing
- mix selection
- and laydown

a feat which may be accomplished with specific knowledge of each bale's trash content)

The Trashmeter consists of a video camera, a video monitor, and a microprocessor-based controller. Since a high resolution CCD (charge coupled device) camera with 93800 pixels is used to scan the sample window of 0.645 sq mm, particles as small as 0.06 sq mm could be detected. All areas darker than an adjustable threshold level are counted as trash. Discrimination between trash and background is made on the basis of absolute reflectivity rather than trash contrast, so variations in cotton background do not affect the readings. The digital image of the trash sample is also displayed on a dedicated monitor. In this way the automatically obtained numeric results are ensured by visual

observation of the sample (proper positioning, no air pockets etc.).

° Colorimeter 932 for color testing

(For over two hundred years color has been considered an important property in cotton evaluation because it influences the value and price of fiber. Can be used for:

- purchasing raw cotton
- monitoring incoming shipments

AND is used by USDA for:

- preparation of grade standards that are subsequently distributed to merchants, shippers, and mills all over the world.)

In the Colorimeter two incandescent lamps positioned at 45° angles to the sample window illuminate the sample during measurement. The resulting light is then filtered, and detected by photodiodes and resolved into the sample's two color components - lightness and yellowness.

° Fibrofine 920 for micronaire testing

(Fiber fineness is one of the most critical parameters in all types of spinning because it affects the quality of the yarn produced.

Technologically the knowledge of fineness permits the spinner:

- to control neps
- to eliminate certain dyeing problems
- reduce slubs
- minimize ends down
- and select the proper raw fiber for the desired coarseness or fineness in the finished yarn.

Financially fiber fineness is important because of:

- cotton is normally discounted for off-standard micronaire
- and since contracts are written based on micronaire specifications.

Fibrofine 920 can be used by the modern mill for checking each bale of incoming cotton to verify that suppliers deliver the quality of cotton that was purchased.)

The sample is put into a large size chamber, in which it is compressed by a piston moving up. Then air stream is forced through the sample (from a mike-like arrangement of the upper cover of the chamber) and the pressure differential is measured. The weight required for the calculation of the micronaire value is passed to the control microprocessor from an electronic balance operating on inductive principle. (The measurement system does not require the usage of

samples of predetermined weight. Any sample with weight between 9.5 and 10.5 grams is acceptable. This is more than three times greater than those of used in traditional instruments.)

Trash and color measurements are carried out simultaneously on the same sample through a shared test window, but each test is controlled by a dedicated microprocessor. This arrangement decreases the time needed for testing significantly. (The total test time is one to three seconds, depending on the amount of trash, with repeatable and accurate test results.) The reliability of fineness testing is ensured by the application of a Swiss-made Mettler balance, a digital equipment which delivers the measurement results directly to the control microprocessor.

Two monitors are available at the right console:

- one displays a digital picture of the sample (helping the user to ensure proper positioning of the sample and to detect air pockets)
- the other is used for communication with the operator (indicating the test results to be obtained/obtained and the commands - in abbreviated form - that can be given); the indication is organised in large letters and numbers in order to read the results as fast as possible

(The overall design is ergonomic to reduce the stress on the operator and eliminate errors in operating the system.)

There is also a numeric keypad in order to enter the sample ID (an optional bar code reader could also be used).

3. The left console which has the:

° Fibrograph 910 for length and strength testing that actually measures five fiber properties that account for over half of the explained variation in yarn

spinnability:

- length
- uniformity
- short fiber
- strength
- and elongation.

(These properties are critical in making decisions concerning:

- cotton purchasing
- the assignment of bales to a particular laydown
- the setting of draft roll spaces.)

Samples are prepared by Fibrosampler accompanying the Fibrograph. After the sample

is prepared (i.e. the test sample is clamped by a Fibrocomb) and presented to Fibrograph the operation is carried out automatically (under microprocessor control):

- automatic brushing mechanism removes loose fibers and parallels the fibers in the sample
- then the sample is transported by a mechanical finger to a travelling comb holder, which presents it to the optical and clamping systems
- next, the sample is presented to the fixed lens where the mass of the sample beard is determined by drawing the beard into a narrow beam of monochromatic light
- the mass of beard is then related to the amount of light absorbed by the beard's individual fibers
- from this:
 - ° mass distribution
 - ° length
 - ° and length uniformity

are calculated

- then the jaws clamp on the fibers and the rear jaw retracts until the sample is broken
- from this the microprocessor calculates:
 - ° strength
 - ° and elongation

: A single monitor is used for communication with the operator, it is similar to the communication monitor on the right console and uses similar mechanisms for communication.

At the end of the testing procedure:

- all results are compiled
- a hard-copy, comprehensive profile of each bale tested is produced by a standard printer
- (- as an option the information can also be sent to a host computer
- and an optional printer can plot fibrogram curves - span-length distribution curves - and stress-strain curves for all fibers
- > these optional capabilities are especially important for laboratory research)

° **The test results are:**

- for trash testing:
 - ° the percent of the inspected area occupied by trash
 - ° the actual number of particles observed
 - ° the trash code number (which is determined by the calibration parameters selected and the standards used)
- for color testing:

- ° lightness expressed as percent reflectance (%Rd)
 - ° yellowness expressed in Hunter's scale values (+b)
- these two values are converted into their equivalents of:
- ° USDA color grade values, which correspond to the USDA Color Meter Block Diagram, the universal standard for grading American Upland or Pima cottons

- for micronaire testing:

- ° micronaire value (determined by passing a metered air stream through a known mass of fiber confined in a chamber of known volume, giving a pressure differential across the chamber which can then be related to the specific surface area of the fiber, the measurement of which gives the micronaire value for cotton)

- for length and stress testing:

- ° 2.5% fiber length
- ° length uniformity (the percent ratio of fibre lengths with 50% and 2.5% frequencies of occurrence)
- ° strength in g/tex (a refined value since it is calculated from the strength required to break the fiber and the micronaire value)
- ° elongation (which expresses the percent ratio of the length obtained during the breaking to the original length)

° Some important **differences in classification documents**:

- for fiber length classifications:

- ° traditional document describes:

- beard length L_p , mm
- modal length L_m , mm
- base, B%
- uniformity M_e
- mean length, mm
- V%

- ° Spinlab 900 HVI System gives a more precise characterisation, the **fibrogram curve**:

- giving a graphic representation of the distances fibers extend from the point at which they are clamped
- allowing tangents to be drawn to generate various mean lengths
- providing a visual indication of fiber length uniformity simply by the shape of the curve itself

that could result in the following main classification parameters:

- uniformity ratio (U.R.), the percent ratio of fiber lengths with 50% and 2.5% frequency of occurrence
- uniformity index (U.I.), the percent ratio of fiber lengths with mean length and those of more than 50% frequency of occurrence

(there are additional parameters indicated at the bottom of the diagram as well)

- for fiber length classifications:

° traditional document describes:

- mean strength P_e , cN
- breaking length R km
- V%
- H%

° Spinlab 900 HVI System gives a more precise characterisation, the **stress-strain curve:**

- a plot of load as a function of fiber elongation generated at a constant rate of extension

that could result in the following classification parameters:

- strength
- elongation
- max. force
- amount
- tare force

(for synthetic fibers four more parameters are indicated at the bottom of the diagram)

° **Calibration characteristics:**

- normal component aging and other sources of calibration drift are automatically compensated by microprocessors controlling the instrument calibrations
- a few tests are run first on each instrument with samples of known value to check if the instrument is in calibration
- if the calibration is NOT in acceptable limits then the operator is informed and he/she is turned to the calibration procedure:

° for the:

- Fibrograph (when testing cotton)
- Colorimeter
- and Trashmeter

calibration consists of:

- testing with:

- standard cotton
- or color tiles

on the instruments

- letting the microprocessors compare the known and measured values of the standards and automatically adjust the calibration coefficients when necessary.

The 900 System can be calibrated using:

- USDA HVI calibration cottons
- international calibration cottons
- OR the user chosen standards (thus enabling the definition of his own calibration scales, which is especially important in testing synthetic, man-made fibers)

The system can store up to 20 sets of calibration data, so 20 different fiber types can be tested.

° for the Fibrofine calibration is done by:

- continuous monitoring of the air flow
- and self-correction when the pressure drifts.

If cotton calibration is required, the operator performs tests using:

- calibration cottons

and following instructions displayed on the monitor. Calibration is then completed automatically.

User value of the 900 HVI System:

° 900 HVI System is essential for running mills with minimal stock of raw fiber since it enables to purchase the fiber in small amounts as needed for production. The reasoning behind:

- sixty to eighty percent of finished product cost goes to purchase raw fiber, so the raw fiber is the most expensive factor in producing yarn

- therefore a reliable quality control system is required for all participants:

- mill managers
- ° cotton merchants
- man-made (synthetic) fiber producers

- it is also the case that the bales could be chosen for a mix¹ that help to:

- ° prevent costly disruptions in the mills
- ° maintain mill production schedules
- ° and produce the highest quality of yarn for the lowest raw fiber cost

THESE ARE ALL QUITE IMPORTANT !

° In countries with not so effective market possibilities (such as Hungary) large amounts of raw fiber are usually purchased, so the application of 900 HVI System is slightly different²:

- purchase price is usually much more important factor than regular and reliable quality
- there are different and year-by-year changing (in quality) amounts of supply that make quite difficult to achieve a regular, steady mix of the input fiber

THEREFORE the main field of application in this case is:

- choosing bales for a mix from an informed perspective
- to achieve regular, steady production processes
- and also regular, steady quality of the finished products

° Of course 900 HVI System is essential for machinery adjustment as well, since Fibrograph:

- ° simulates the arrangement of fibers in the draft zones
- ° measures the actual fiber segment length which extends into drafting

its information may guide spinners in adjusting:

- ° draw frame
- ° card
- ° and comber

machinery settings.

° The ultimate result of such fine adjustment is:

- ° **Increased operating efficiency**
- ° **and predictable yarn quality**

° An additional advantage of the 900 HVI System comes with the optional Controller software that is capable of calculating a projected yarn strength factor for each bale from test results, giving two different category numbers (referring to separate category systems):

1. formulated for open-end spinning machinery
2. tailored to ring spinning machinery

thus **warehousing and mix choosing** decisions could be made properly.

Candidate methods for measuring moisture in cotton for use with HVI systems

° to ensure instrument agreement and accuracy, cotton samples must be conditioned to within a specific range of moisture content, and testing must be performed in a temperature and humidity controlled environment, since **some HVI fiber measurements are greatly affected by changes in fiber moisture** (eg. the most sensitive is fiber strength, which increases nearly 10% for a 1% increase in moisture)

° an accurate moisture measurement during HVI testing should be beneficial in comparing strength results from different testing laboratories and in assuring that samples are conditioned to the proper moisture level.

° four methods are used in present:

- three methods measuring electrical properties of cotton that are employed in commercially available instruments:

° capacitance:

- Continental Specialties Corp. model 3001 capacitance meter used as a modern instrument to measure capacitance in a precision dielectric measuring cup containing two circular electrodes measuring 4.8 cm in diameter

° and two conductivity methods:

- Hart moisture meter to measure the electrical conductivity through cotton samples compressed between two flat circular electrodes 4.8 cm in diameter

- Strandberg moisture meter to measure the electrical conductivity between two sharply pointed electrodes pressed into the cotton sample surface (2.54 cm apart)

- one method measuring the reflectance of near infrared light (a laboratory spectrometer could only be used)

° of these four methods the long wavelength light reflectance method was found to be the most accurate, so it will probably be used in future HVI equipment

¹ If the exact characteristics of the raw fiber are known, a consistent and homogenous blend may be fed into spinning machinery

² While in US each bale is tested, in Hungary a 10% representative testing is the regular case, which indicates also the differences in manufacturing practices of those countries.

RECOMMENDATIONS FOR CENTRE II., DANANG

1. Organise the Work Information System (library of local and international standards, equipment books, work instructions, system for updating documents, maintenance system, according requirements of ISO/IEC Guide 38-1983).
2. Organise a special room for weathering tester (QUV) to carry out the test procedure full time (24 hours/day) in the space where the fire-security is provided, rearrange the equipment to more proper position (Annex).
3. Move light and textile industry laboratory to the more convenient room inside of the building.
4. Cover different equipment with precaution bags made of 100% cotton material (white or light blue color to protect the equipment against the dust etc.).
5. Prepare the labels: - installation
 - calibration
6. Recommendations about the library are given in Annex .
7. Have more ISO, ASTM or BS standards in the library of laboratory.
8. Carry out the training for 2 persons in laboratory of Centre I. in Hanoi in order to be be prepared for new testing activities.
9. Organise test procedures on the Laboratory's equipment for factories all the time.
10. Prepare proper and well organised Test Reports for clients according to the examples given in Annex 5.

Reccomendation No. 2. has already been accepted by the board of Center II. A room in the neighborhood was allocated for Textile and Light Industry Laboratory within the days following the problem's discussion with Mr. Bao, director of Centre II.

The main activities in Centre II., Danang

The Expert arrived at duty station on 19. 01 and left on 11. 02.1991.

Details of textile expert's activities are given in Annex 1., according to the Job Description.

The main activity was: to apprise the existing situation for organizing quality control procedures for textile and light industries of Danang in the Laboratory in Centre II.

In Textile and Light Industries Laboratory the following equipment were put into operation:

1. Air Permeability Tester (type:Textest FX 3030XX)
2. Yarn Reel (type:Textest)
- 3..Weathering Tester (type: Q.U.V.)
4. Twist Counter
5. Universal Testing Machine (type: 142500 ZWICK)
6. Gray Scale (S.D.L.)

Air permeability Tester, Yarn Reel, Twist Counter, and Gray Scale were put in proper condition. Staff of Laboratory were properly trained according to the program.

During the installation of weathering Tester electrical defects were discovered. The location of defects was: the Cycle Time had electrical defect in electrical hour unit. It was repaired with assistance of electrical engineers of Centre II.

The Staff were properly trained to performance the test procedure.
(Different textile and light industries products were tested during 168 hours: colorfastness to sunlight for textile, plastic, paints, wool carpets, wool and cotton

yarns.) The operation time was long enough to carry out procedure of evaluation with device Gray Scale.

For proper performance of the test procedure on "Q.U.V." it is the matter of urgency to purchase the "Blue Scale" device. The Expert Highly recommends to use this instrument in full capacity.

"Q.U.V." instrument needs a special room where the staff could run test procedures in full time (including Sundays). An environment for the instrument has to be provided in which the test procedures could be carried out safely and according to the requirements of the prescribed conditions of instrument manual (Recommendation).

U.T.M. Testing Machine

The staff of the laboratory and experts from another laboratory asked the Expert to keep short training course about combination of microprocessors with electrical and mechanical units in Universal Testing Machine. Manual training courses were completed on U.T.M.

Practical guidances were given for:

- Air Permeability Tester
- Weathering Tester
- Universal Testing Machine

In accordance with the international practice the equipment which is subject to calibration (file for data of calibration: date of calibration, validity of calibration.) includes the following instruments:

- balances,
- Universal Testing Machine (according to manual),
- length measuring Reels,
- twist counter,
- Air Permeability Tester,
- Weathering tester (Q.U.V.)

During installation of the equipment and during the training course Expert gave information about:

1. Test procedures for evaluation of the comfort of the clothes, and basic definitions of the following procedures:

- water vapour permeability,
- water absorptivity and capillarity
- air permeability
- importance of the standard atmospheres for conditioning and testing
 - *moisture content
 - *moisture regain
 - *pre-conditioning
 - *conditioning

Introduction in color and color difference:

- *relative luminous efficiency
- *some methods of representation of color (numerical color solid, CIE color system)

A draft for Arrangement of Testing Instruments had been prepared and discussed (Annex 6).

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Expert recommends: make more space for carrying out the tests in the Equipment Environment. Proper Furniture has to be purchased. Operator has to have more space when he could carry out the test procedures. Sinks with water tap have to be inside the Laboratory.

Laboratory needs more light. At least three additional spots of light are recommended.

The air flow of air-conditioning system has to provide proper environment for test procedures.

Proper measuring temperature and humidity has to be arranged (electronic equipment are sensitive to humidity).

The Staff of the Laboratory consists of three persons including the Head of the Laboratory. The experience of staff in testing procedures of Textile and Light Industries products is very low. The training given by UNIDO Expert provided a possibility to carry out a full scale training on the equipment of the Laboratory properly.

The Staff learned in this way and knows by now:

- the handling of the Equipment belonging to the Laboratory,
- to perform test procedures to measure the main properties, according to prescribed methods,
- daily maintenance and cleaning,
- handling of the samples (identification, registration),
- calculating of the testing results,
- controlling and analyzing testing results,
- arranging test results into tables and formats.

The Staff need more training for equipment which can be obtained in the future (recommendation for purchasing equipment in future: Annex). Training program can be provided by laboratory of Centre I, where the Light Industry Laboratory has rather large selection of equipment (at least two persons for 10 days).

Higly recommended for the Staff from the begining of activities to keep in order administrativa procedures according the Quality System. Recommendations were forwarded to the Head of Laboratory in Centre II.

Seminar

To introduce the activities of Textile and Light Industries Laboratory a seminar was performed in Centre II.

Opening speech was held by director of Centre II who introduced the Consultant of UNIDO.

The topics of seminar are given in Annex 13. On the Seminar about 30 participants were present. They had opportunity to discuss on a bilateral basis the local industrial problems. Consulting was given in professional questions as well (Quality Control).

The activities of Textile and Light Industries Laboratory were practically demonstrated by members of the staff. The Staff of the laboratory participated in active way on Seminar and assisted in demonstration of test procedures, gave the explanations.

A video film about the activities in the frame of UNIDO project was shown.

Consultant of UNIDO together with Staff demonstrated to the participants results of checking the quality of factories' samples preliminary obtained from potential clients with the assistance of the new equipment.

RECOMMENDATIONS

to purchase the equipment for Textile Laboratory in Centre II in accordance with priority given in Annex

Priority	Name of Equipment	Quantity	Specification	Reference
Priority No 1.				
0	accessories for "ZWICK" automatic clamp	1 set	necessary	hardware and software
1	Blue Wool Light Fastness	1 set	model: ND 1001DP	
2	Color/color difference meter	1 pcs	voltage 220/50 Hz	Ogawa Seiki Co. Ltd. Japan
3	International calibration cotton	1 set		SDL, Crown Royal, Shawcross Str. Stockport SK1 3 yw England
4	Shirley Electronic Crockmeter	1 pcs		SDL
5	Shirley sample cutter	1 pcs		SDL
6	Shirley Autowash (8 tube)	1 pcs		SDL
7	"Uster"	1 pcs		SDL
Priority No. 2				
Equipment for quality control of fibres				
1	Fineness and maturity	1 pcs	IIC-Shirley Fineness/ Maturity Tester	SDL
2	Trash content	1 pcs	Shirley Analyser MK-2	SDL
3	Tensile Properties of single fibre	1 pcs	single fibre strength tester	SDL
4	Tensile properties of breaking strength in bundle	1 pcs	Pressley strength tester	SDL

Work plan for Light and Textile Industries Laboratory in Centre II, Danang.

1. To supervise the distribution of the Equipment for Textile and Light Industries Laboratory in Centre II
2. Arrangements of Instruments in the best positioning in laboratory (according to the power supply, temperature, air humidity, vibration)
3. To put into operation instruments and initiate training programmes according to the knowledge of laboratories staff.
4. Industrial visits to appraise the effectiveness of their quality control system, to give guidance and recommendations .
5. To held a seminar for experts of textile and light industries concerned of high priority of the checking quality of products in textile and light industries and encourage the factories to use the capacity of the laboratory in Centre 2 to improve the quality of their products.
6. Giving recommendations for Centre II.

Standards necessary to carry out test procedures in proper way

From the library of Centre I. it is necessary to supply Centre II. by following standards for carrying out the test procedures in a proper way:

1. Standard method of test for differential dyeing behavior of cotton.
2. Standard method of testing sewing thread.
3. Standard method of testing for air permeability of textile fabrics.
4. Standard method of testing for dimensional changes in laundry of woven or knitting textiles.
5. Standard methods of testing for moisture content and moisture regain of textile materials.
6. Standard methods of testing for color change of textile fabrics due to flat abrasion.

Report of checking UTM Type 1425

1. The remote control unit of UTM does not work properly. After turning on, the following indications are shown on its display:

- 8888 is displayed in the digital part (for about 2 seconds)
- **** is displayed in the digital part (for about 2 seconds)
- All control lamps light up (for about 2 seconds)

After 2 seconds the LIM text and a number (approximate ± 0 , ...) are displayed in digital part, and a control lamp F (in displ. column) lights up.

When we press any button on the remote control unit nothing happens (nothing moves, not any light or symbol is activated).

2. From manual:

- p. 6.2 Fault displays and their remedy

After pressing any digit, nothing happens, we can go by traverse cross head "up" continuously; upper L_0 - limit switch "up" does not work. We can not go down: L_0

- limit switch "down" does not work..

- Remote control unit signalization arrow "down" is displayed. We can not change R.C.U. to other direction arrow "down".

- 6571.21b functions:

"Emergency off" works and executes properly the stop procedure.

Interlock button "up" works, b7

Interlock button "down" does not work, b8.

Main switch "ON, OFF" works properly.

- Tripping device mechanism

(moving only 8 mm - up and down for limit stop)

Trip rod has scratch 10 cm

Seminar Topic

- General review about importance of testing activities in textile and light industries production, selling, buying, marketing, or usage of many materials and products.

- General review about uniformity of presentation of test results.

- Profit impact of marketing strategies.
Importance of quality based on market surveys.

- Expectations referring to a clothing product.
The clothing product has to be fit for use and has to satisfy aesthetics and fashion needs.

- Inspection loops, early detection of defects, feed back of information, determination of the cause and CORRECTION of the problem.

- Inspection by attributes and by variables certain characteristics are assessed as conforming or not to specified requirements or measuring quantity characteristics.

- Different type of inspection, referring to products: receiving, in-process, final.

- Type of test, accepted quality level, referring to product and to supplier.

Industrial visit to Danang

Expert visited 5 textile factories in Danang province to give introduction for industrial experts how to use the capacity of Light and Textile Industries Laboratory, to improve cooperation between factories and laboratory of Centre II.

On the seminar held in Centre II. many industrial experts and experts from commercial field have participated.

REMARK

AIR. CAIR CONDITIONER

WATER SINK

BUILT IN OPEN SHELVES

INSTRUMENT FOR TEMPERATURE AND HUMIDITY

ADDITIONAL LIGHT

CUPBOARD FOR SAMPLES

1 AIR PERMEABILITY TESTER

2 YARN REEL YT 2200

3 UNIVERSAL TESTING

4 TWIST COUNTER

5 ACCELERATED WEATHERING TESTER

6 BENCHES & TABLES

WINDOW

DRAFT FOR THE ARRANGEMENT OF TEXTILE AND LIGHT
INDUSTRIES LABORATORY

- TESTING INSTRUMENTS OF THE LABORATORY