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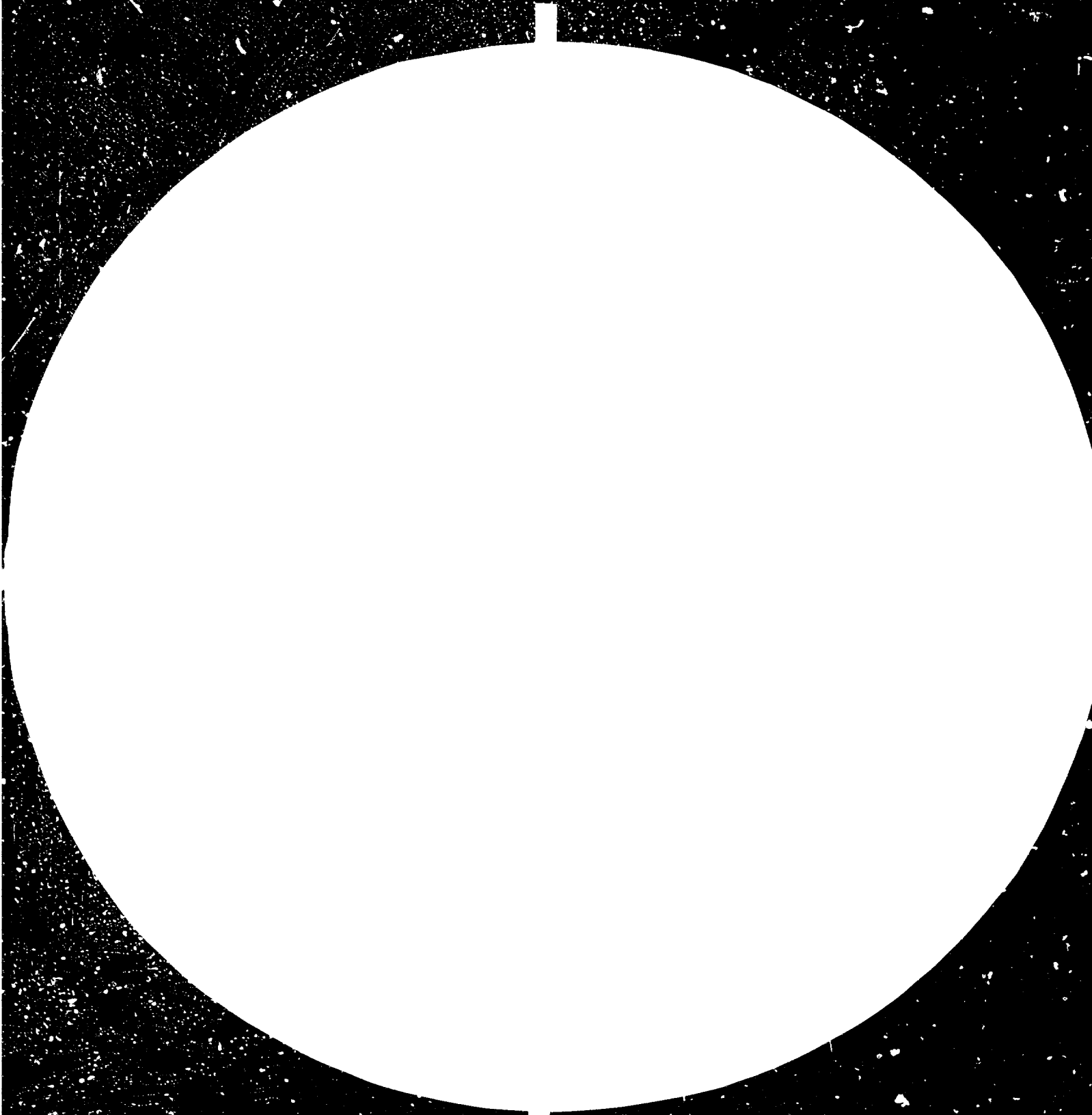

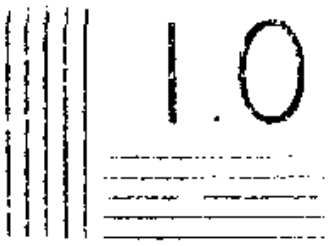
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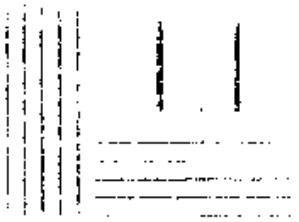
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DEVELOPMENT OF TEXTILE RESEARCH

DP/ROM/78/021

ROMANIA

Terminal report

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

Based on the work of Stephan B. Sello,
expert in finishing and dyeing of textiles

United Nations Industrial Development Organization

Vienna

V.82-20737

Explanatory notes

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

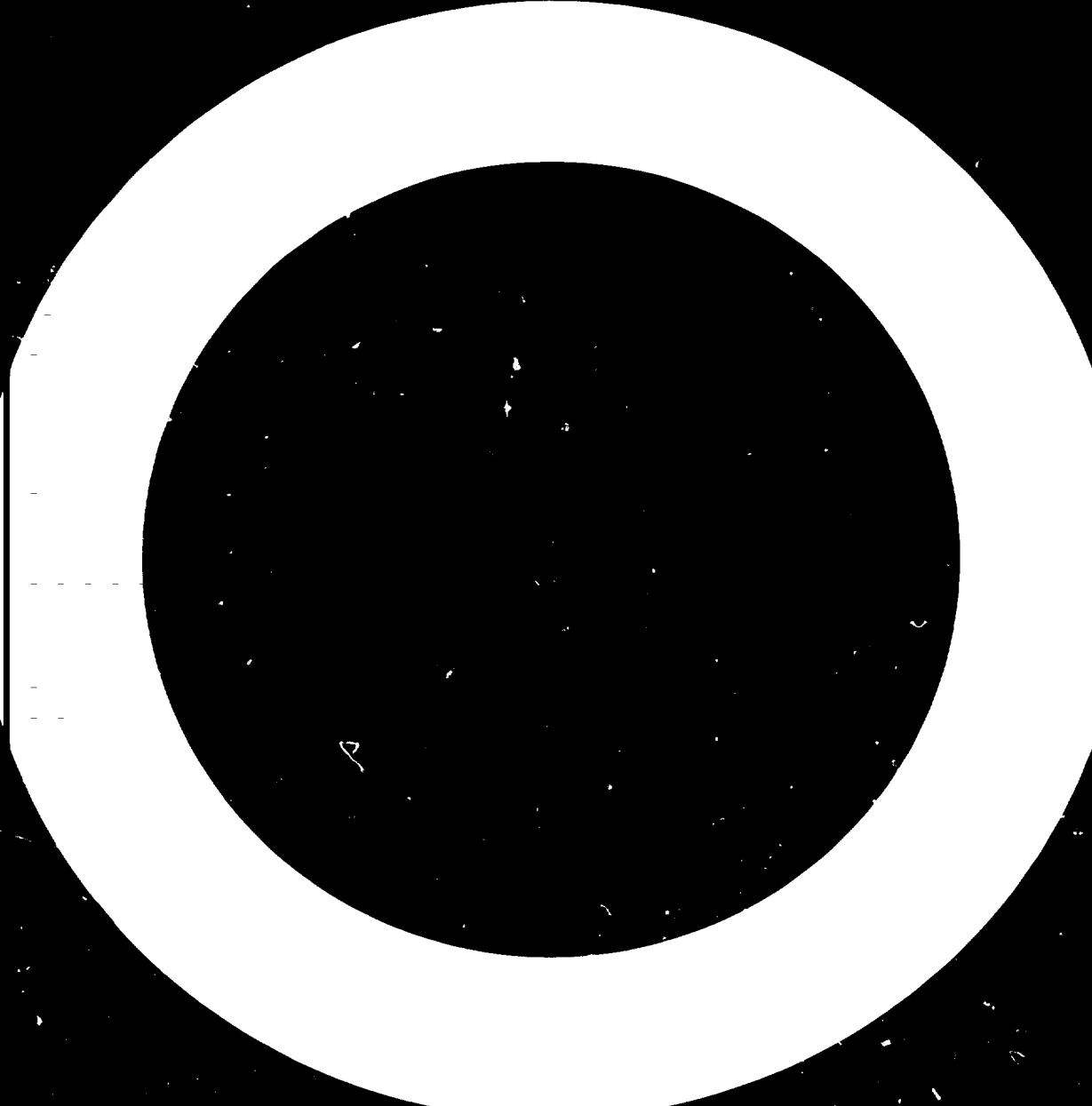
The monetary unit in Romania is the leu (plural lei). During the period covered by the report the mean value of the leu in relation to the United States dollar was $US 1 = 11.5 lei.

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

ABSTRACT

The project "Development of textile research" (DP/ROM/75/021) began on 1 January 1978 and lasted three years. It was the result of a request by the Government of Romania for assistance from the United Nations Development Programme (UNDP) in providing the Textile Research Institute with equipment, expert assistance and fellowships. The United Nations Industrial Development Organization (UNIDO) acted as executing agency for UNDP; the Ministry for the Light Industry, which has jurisdiction over the Textile Research Institute, was the government co-operating agency. The UNDP contribution was $394,443 and included $27,671 for four experts, $37,843 for eight fellowships (nine study tours), $235,929 for equipment and $3,000 miscellaneous. The government contribution was 65,235,000 lei.

The long-range development objectives of the project were to: increase the utilization of synthetic fibres produced in Romania, introduce energy-saving textile processes and improve the quality of textile products. Most of the immediate objectives have been achieved, namely, the improvement of processing technology for and utilization of open-end spun yarns, development of low formaldehyde resin finishes, utilization of pigmented dark wool and development of hydrophilic finishes for synthetic textiles. However, work is still going on in the following areas: (a) expanding the development of blend fabrics containing polyester/natural fiber warp and polyester filament weft yarn including fabrics with weft stretch properties; (b) controlling the formaldehyde level in the textile plants; (c) developing energy-saving low wet pick-up finishing procedures with special emphasis on foam application; (d) ensuring adequate spare parts supply for the equipment acquired within the framework of the project; (e) studying the possibility of size recovery; and (f) keeping abreast with new foreign development abroad.



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INTRODUCTION

The textile industry in Romania, which in 1975 ranked fifth in total industrial production and employed 12.4% of the total labour force, has been growing steadily, production in 1975 being 20 times that of 1945. None the less, its growth has been slower than that of other industries. Therefore the Government of Romania included in its five-year plan for 1976-1980 a special programme for the textile industry aimed at achieving the following growth rates: cotton cloth production, 20%; silk-type cloth production, 65%; wool processing, 30%; flax-hemp processing, 150%; and knitted fabrics production, 60%. In order to achieve these goals, the Government of Romania requested assistance from the United Nations Development Programme (UNDP) in providing the Textile Research Institute with equipment, expert assistance and fellowships.

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FINDINGS AND RECOMMENDATIONS

Findings

1. The Textile Research Institute, to which the project was attached, is a well organized, adequately equipped research organization with several well trained, highly experienced staff members. The prerequisites thus existed for the project's successful implementation.

2. Only those research areas where the results seemed to be controlable and measurable were selected as immediate objectives. This narrow focus greatly contributed to the success of the project.

3. The excellent relations of the Textile Research Institute with the various branches of the textile industry helped in promoting the commercial use of the research results.

4. The research staff of the Textile Research Institute has only limited contact with foreign research workers, only a small number of foreign scientific and technical journals are subscribed to by the Institute and the scientists usually do not participate at international conferences. The staff has only limited experience in presenting and publishing scientific and technical papers.

5. It can be considered an achievement that several research studies carried out in the framework of this project were presented at the Eighth National Technical and Scientific Conference of the Light Industry organized by the Textile Research Institute in Bucharest in October 1981.

6. The research staff and also the chemists, engineers and technologists affiliated with the Textile Research Institute and the textile industry have been very receptive to new ideas, and are ready to search for new technical approaches.

7. At present the greatest attention is focused on energy-saving approaches in Romania. Therefore, the application of processes such as low wet pick-up finishing and dyeing techniques should be introduced without delay.

Recommendations

1. The development of blend fabrics containing 67/33 polyester/cotton warp and texturized or non-texturized filament polyester weft yarn should be scaled up.

2. The development of the above fabrics also with 12-20 weft stretch properties should also be scaled up.

3. Blend fabrics containing 55/45 wool/polyester warp and texturized or non-texturized polyester weft yarn should be developed.

4. The releasable formaldehyde level should be controlled, not only in the finished textile products but also in the textile plants in order to assure that the workers will not be exposed to higher than a maximum of 3 ppm formaldehyde level in the air during the eight-hour work time.

5. The releasable formaldehyde level should be measured not only by the Japanese test, but also by the more severe "sealed jar test" adopted in the United States of America. The introduction of this test is important in certain markets.

6. The operation of the equipment (value $326.000) acquired within the framework of the project should be ensured through the supply of adequate spare parts and accessories.

7. The possibility of introducing size recovery procedures in the Romanian textile industry should be studied.

8. A variety of energy-saving procedures should be studied including foam finishing using the newly developed foam applicator with a high capacity foam generator and also the use of engraved rollers for low wet pick-up finishing as an alternate method for foam application.

9. Additional foreign scientific and technical journals should be subscribed to in order to keep the research workers aware of new developments in their respective fields.

10. Greater participation of the research workers at international conferences should be ensured.

I. OBJECTIVES OF THE PROJECT

In 1975, when the project was proposed, the Romanian textile industry employed 317,000 persons in the 154 existing plants, representing 12.4% of the total work force employed in industry. The textile industry accounted for 6.8% of total industrial production ranking fifth after the machine building, food, chemical and metallurgical industries.

In 1975 the total production of textile goods was about 20 times that of 1945. During the period 1971-1975 investment reached 11,403,000 lie or 4.1% of all funds invested in Romanian industry. Nevertheless, the growth of the textile industry has been lower than the average of all other industries. Therefore the Government planned a special programme for the rapid development of the textile industry during the five-year plan for 1976-1980.

The five-year plan aimed for 20% growth in the processing of cotton-type fabrics, 65% growth in silk-type and 30% growth in wool-type; 150% growth in flax-hemp processing; and 60% growth in the production of knitted fabrics.

In order to assist in achieving the targets of the five-year plan, the Ministry for the Light Industry of Romania requested financial assistance from UNDP to provide the extile Research Institute, which is under the jurisidction of the Ministry, with laboratory and pilot-plant equipment, short-term missions of foreign experts and individual training of Romanian research workers abroad.

The Institute has good laboratory and pilot-plant facilities for analytical and testing services. It has approximately 740 employees, including about 180 university graduates, among its research and design personnel. Thus, with the assistance received from UNDP/UNIDO, the Institute was well equipped to perform the research work designed to attain the project objectives.

A product document, prepared by the Romanian Government, was revised in 1978 with the assistance of a UNIDO consultant. The objectives of the revised project are summarized below.

The long-range development objectives were to:

(a) Increase the utilization of domestic synthetic fibres. The target share of man-made fibres (synthetic and cellulosic) in total fibre consumption was 42% for 1975. It had been planned to attain 65% by 1980, thus reducing imports of cotton and wool;

(b) Develop more economical and especially energy-saving textile production procedures;

(c) Assist in improving the quality of textile products in order to remain competitive on the world market.

The immediate objectives were to develop:

(a) Optimum processing technologies and find fields of use for cellulosics and cellulose/synthetic blends spun on open-end spinning machines;

(b) Resin finishing with low formaldehyde release for easy-care cellulosics and polyester/cellulosic blends;

(c) Low wet pick-up continuous dyeing and finishing procedures, as well as transfer padding, foam dyeing and foam finishing processes, that save

(d) A continuous thermosol dyeing and resin finishing process for blends with a high polyester/low cotton content;

(e) An improved decolourizing process for naturally dark-coloured wool;

(f) Hydrophilic finishes for textiles made of hydrophobic synthetic fibres to attain improved comfort, durability and antistatic and soil-resistant characteristics.

The immediate research objectives are important for the Romanian textile industry and achievements in any of these fields would be helpful in attaining the goals described in the long-range development objectives. A detailed research programme was prepared for each research objective.

II. ASSISTANCE PROVIDED TO THE TEXTILE RESEARCH INSTITUTE

Experts

The following UNIDO experts were in Romania during the project:

Name	Months	Field
J.V. Morris	1.0	Garment physiology
S.B. Sello	2.7	Finishing and dyeing of natural and synthetic textiles
F. Simon	1.0	Computerized colour measurement
J. Sparrow	0.3	Electron microscopy

Fellowships

Five members of the senior research staff of the Institute visited France, the Federal Republic of Germany and the United Kingdom of Great Britain and Northern Ireland to obtain information on planning and organization of research and on new trends in textile research in developed countries of Europe. They acquired valuable information on new fibres, dyestuffs, chemicals, and on dry and wet processing of textiles. The 38-day tour included visits to l'Institute Textile de France and Ugine Kuhlman in France, Aachen Wool Research Institute, Krefeld and Denkendorf Research Institutes, Kleinewefers, Küsters, Hoechst and BASF in the Federal Republic of Germany and the Imperial Chemical Industries and the International Institute for Cotton in the United Kingdom.

In the Federal Republic of Germany, one research worker studied scanning electron microscopy in Karlsruhe and Aachen for 21 days, another studied the finishing of cotton and cotton/synthetic blends for 48 days and two researchers studied dyeing and finishing techniques and equipment at Bayer, BASF, Hoechst, Böhme, Enka, Thiess and Fleissner for 46 days. One researcher had 90 days of training in the analysis of fibres and textile chemicals in France at l'Institute Textile de France and at the laboratories of Rhone Poulene and Ugine Kuhlman and in Switzerland at the laboratories of EMPA and Sandoz. The head of the testing services of the Institute spent 39 days at EMPA in Switzerland to get information about new, modern, efficient testing techniques. Two research workers visited dyestuff and machine manufacturers in Switzerland and the United Kingdom for 28 days to get information about new products and procedures.

All fellowship recipients were interviewed after the completion of their study tours. They found the tours very valuable and utilized the newly acquired knowledge not only in their own work, but disseminated information among other members of the Institute and the Romanian textile industry.

Equipment

The following major laboratory and pilot equipment were acquired in the framework of this project:

1. Laboratory finishing range
2. Universal dyeing system
3. Open-end spinning machine
4. Thermo-analyser
5. Laboratory foam generator
6. Scanning electron microscope
7. Humidity and air-temperature control

Equipment items 1 to 6 are in operation and have already been used in the research work connected with the immediate objectives.

The installation of the humidity and air-temperature control equipment (item 7) is in progress.

III. ACHIEVEMENTS OF THE PROJECT

The research and development work to attain the immediate research objectives was completed successfully in most project areas.

Processing technology was developed for cellulosics and synthetic fibre/cellulosic blends made of yarns spun on open-end spinning machines. The spinning has been carried out on the Spinntester Suessen (acquired within the framework of this project) and later also on open-end spinning machines in plants (some 200 open-end spinning machines are in use at present in the Romanian textile industry).

The introduction of open-end spinning makes it possible in many cases to use carded yarns for purposes where, with ring spinning, only combed yarns were used. The quality of the fabrics made of open-end spun yarns was superior as regards naps, yarn uniformity etc.

Durable-press cellulosic fabrics and synthetic fibre/cellulosic blend fabrics with low formaldehyde release were developed. Based on a systematic study, suggestions have been made on the permissible formaldehyde release level for various types of garments. The proposed levels of releasable formaldehyde (determined by the Japanese test method) are as follows (in ppm):

Children's wear (0 to 24 months)	15
Children's wear in contact with skin (over 24 months)	75
Adult wear in contact with skin	300
Outerwear	1,500

Chemicals and application techniques were developed and recommended to attain the formaldehyde release levels described above.

As a first approach, foam finishing was studied as a low wet pick-up application technique. Suitable foaming agents and foam stabilizers were selected. A pilot-scale machine was designed in the Institute for foam application. This machine is a versatile applicator, suitable for applying foam by both horizontal pad rolls and also with four types of coating techniques. The uniformity of the foam-finished fabrics was found to be satisfactory and the energy saving effect of the process was demonstrated. The foam was generated by a low-capacity foam generator, acquired within the framework of the project;

Further plant-scale work for foam finishing is not possible without a larger capacity foam generator. It is estimated that the generator with a 100-600 kg/h capacity would cost $45,000.

In order to study the continuous thermosol dyeing and resin finishing of high polyester/low cotton blends, several fabrics were woven in plain and diagonal weave with the following polyester/cotton ratios: 67/33, 75/25, 86.3/16.7 and 87.5/12.5. All these fabrics have the same warp and weft yarn count. In addition, the weaving of a fabric consisting of 67/33 polyester/cotton warp and 100% filament polyester filling is in progress and has been given high priority. This type of fabric has been introduced recently in several countries that have highly developed textile industries. It saves spinning capacity and gives an opportunity to develop weft stretch fabrics.

A study was made on the utilization of naturally pigmented, dark domestic wool. Semi-coarse and coarse wools from Romanian sheep contain about 13-15% highly pigmented, dark wool of low value. Since the price of decolourized wool approaches the price of virgin wool, the decolourization of this dark wool cannot be regarded as economical.

It is suggested to use highly pigmented non-decolourized wool in conjunction with dyed virgin wool or dark-coloured man-made fibres. As a result of the study the Romanian wool industry now employs the highly pigmented fabrics for outerwear garments, blankets, tufted carpets etc.

Hydrophilic finishes were developed for textiles made of hydrophobic synthetic fibres - hydrophilic polyether-polyester finish synthesized for polyester textiles and hydrophilic polyamide finish for polyamide textiles. This development enables the Romanian textile industry to produce 100% synthetic textiles with improved characteristics (wettability, soil release etc.) without the purchase of expensive foreign textile auxiliaries.

The equipment acquired within the framework of the project has been used for the research work aimed at achieving the immediate objectives described in the project document. The electron microscope and the thermo-analyser are indispensable for the characterization of fibres and the humidity and air-temperature control equipment is necessary for meaningful physical testing. The Benz finishing and thermo-setting range and the Hanau universal dyeing equipment are widely used in textile finishing research and development work.

The technical knowledge acquired through the study and fellowship tours and also through the many discussions with the international experts contributed greatly to the success of this project.