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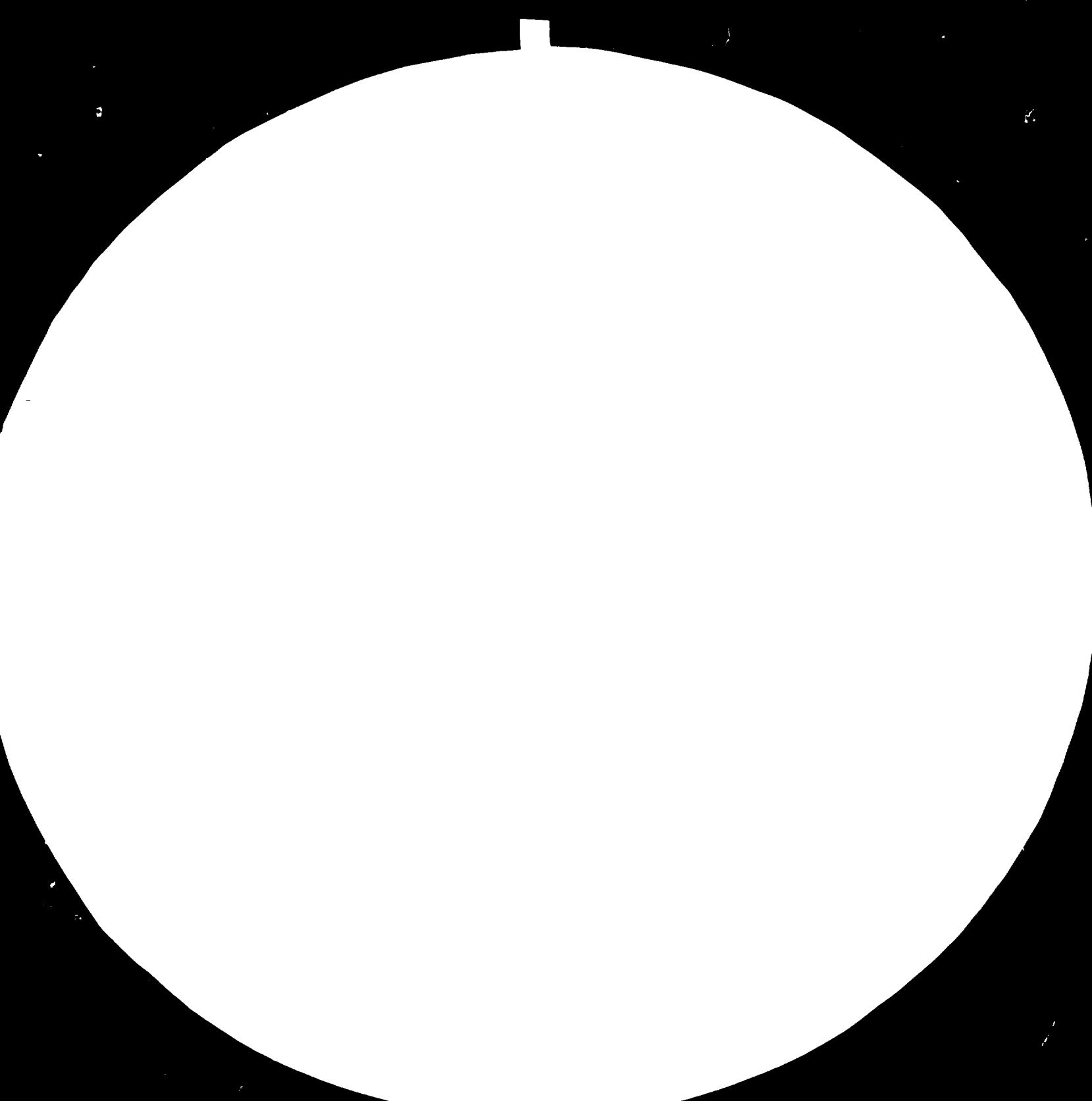

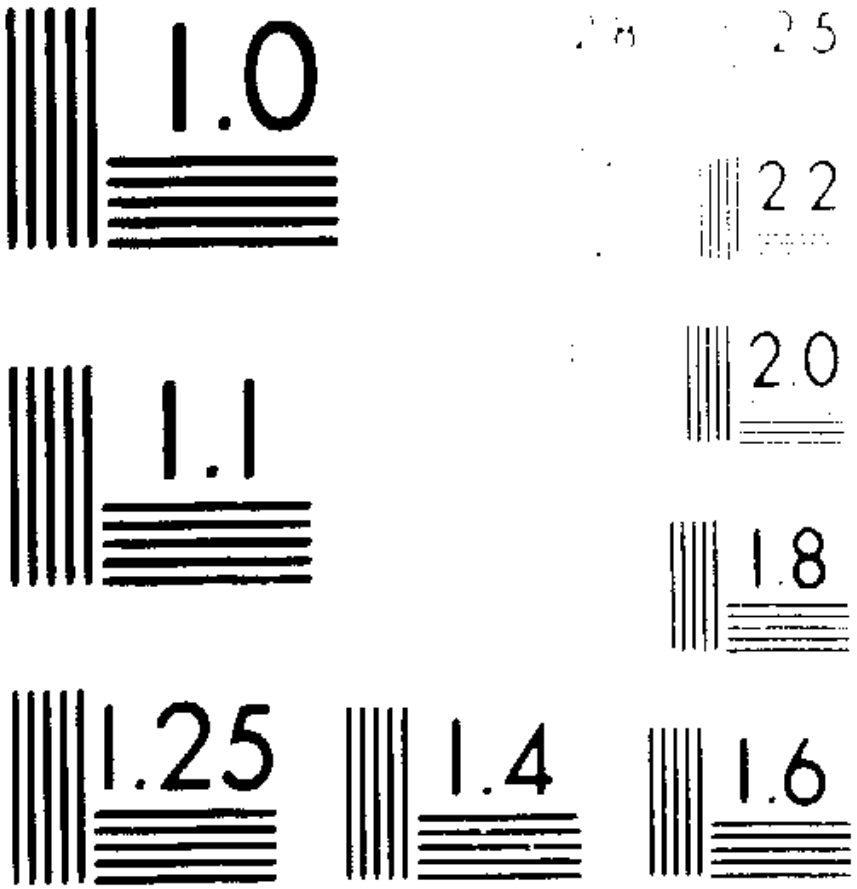
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EXTENSION OF POLISH PACKAGING CENTRE

DP/POL/77/001

POLAND

Terminal report*

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

Based on the works of J. Lekszycki and Z. Kostro

United Nations Industrial Development Organization
Vienna

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ANNEXES

## I SUMMARY OF THE MAIN COMPONENTS OF THE PROJECT

### Experts

All UNIDO experts assigned to the Project completed their duties, (see Annex No 5)

### Fellowships

Out of twenty-six fellowships and three study-tours scheduled in the Project, twenty-four fellowships and all study-tours were implemented. One fellowship has been deleted and the remaining one will be arranged in the nearest future. List of fellowships and study-tours - see Annex 7 and 8 respectively.

### Equipment

Ordering and delivering equipment provided by UNIDO/UNPD is almost completed. The remaining item - simultaneous interpretation system, will be delivered in March 1981. List of equipment - Annex No 9.

Delivery and installation of equipment provided by the Government is in principle completed (temporarily in the existing buildings of the Demonstration Plant until the new one is finished).

### Investment

Construction of the II Stage of the Demonstration Plant at Białystok owing to the situation in our country is delayed. It is planned to complete the work in 1981.

## Research and development activities

During the project duration the Packaging Research and Development Centre conducted 15 training courses and seminars which were attended by 484 participants, and carried out about 206 technical tests, elaborated 54 consultancy projects and technical specifications for industry and worked out about 110 research subjects.

PRDC acts as coordinator of scientific-research and design work in 25 institutions involved in packaging in Poland. It should be emphasized that with ca. 12 research units employing 335 persons the cooperation is very close (list of these institutions is given in Annex No 3).

## Cooperation with the developing countries

During the Project implementation, 16 fellows from the developing countries were trained in research institutes and industrial laboratories.

Moreover 4 Polish experts in the packaging field were assigned by UNIDO to advise the newly-established packaging research institutes in the developing countries in Asia, Africa and Latin America.

A proposal concerning cooperation in training field was prepared and submitted to UNIDO.

## II BACKGROUND

At the motion of the Minister for the Materials Economy, Mr. Eugeniusz Szyr, the Government in its decision No. 28/77 of 11 March 1977 included the II Stage of UNDP/UNIDO Project entitled "Extension of the Packaging Centre" DP/POL/77/001 in the general programme of cooperation between Poland and UNDP for the period 1977-1981.

The I Stage of the Packaging Project DP/POL/7[illegible]/517 under the title "Extension of the Polish Packaging Centre" was implemented during 1973-1975 and covered UNDP contribution of $ 271,900 and the Polish contribution amounting to 348,422,900 zlotys (figures shown after the final revision).

The assistance rendered by UNDP through the above-mentioned project contributed to the creation of a central packaging basis in Poland in the field of management, coordination, research and experimental work. In this period the National Packaging Centre and the Packaging Research and Development Centre (reorganization of the Polish Packaging Centre) were set up and the Packaging Demonstration Plant in Białystok was designed, constructed and the production of plastic packages was started.

In this way due to creation of appropriate conditions it was possible to give assistance in the field of technical and experimental work to the developing industry.

In the present II Stage of the Packaging Project DP/POL/77/001 under the title "Extension of the Packaging Centre" the UNDP contribution was at the beginning $ 270,000 and the Polish contribution - 574,969,400 zlotys.

Finally after consideration of several revisions made in the period 1978-1980 UNDP contribution increased to $ 312,787 and the Polish contribution amounted to 534,407,355 zlotys.

The basic objective of the II Stage of the Packaging Project was to make all preparation aimed at giving continuous assistance to the developing countries in the field of packaging and packaging materials production.

Achievement of this objective was scheduled in two phases, namely by:

1. Strengthening the technical basis and skills in the central research unit and scientific-technical support in the packaging field.
2. Undertaking organizational and technical activities aimed at giving assistance to the developing countries in solving their priority problems and to train specialists from these countries in the packaging field.

Development trends in the packaging area in Poland are directed towards the creation of a modern Scientific Production Centre with pilot plants in basic branches selected in different industries.

## III OBJECTIVES AND LOGIC OF THE PROJECT

Actually implemented Project DP/POL/77/001 is the continuation of the Project DP/POL/71/517 entitled "Extension of the Polish Packaging Centre" which was completed at the end of 1975. The basic target of that Project was the development of the central scientific-research basis in packaging in Poland. In the following project the main pressure was put upon activities connected with the introduction of the technical progress, acceleration of development in different branches involved in packaging - scientific technological support, producers of packaging materials and packages and their users. A list of institutions cooperating in this field is enclosed to this report as Annex No 3. Their activities cover first of all the development aspects connected with the elaboration of new technologies, tests on materials suitability, machineability, making expertises and tests for the needs of industry as well as technological studies which are mostly coordinated by the Packaging Research and Development Centre (PRDC) within so-called "Branch Problem". This is a way which allows to eliminate overlapping studies and to make selection of research works ensuring their introduction into production. This was also the reason for creating the basis for achievement of the second long-term objective of the Project which is - "creating of technical - research basis for entering into close cooperation between Poland and the developing countries and rendering them assistance in the packaging field."

Because of limited funds the achievement of the immediate project objectives which are as follows:

- development of production of packaging materials and packages for foodstuffs,

- standardization of packaging materials and packages,
- improvement of quality of packaging materials and packages,
- improvement of effectiveness of materials consumption and machines utilization,
- adaptation of packages to the requirements of exports,

concerned only PRDC and the following units representing the scientific-research support:

1. Packaging Demonstration Plant - Białystok,
2. Pulp and Paper Institute - Łódź,
3. Central Laboratory of Fish Industry - Gdynia,
4. Training Centre in Packaging - Białystok.

Actually there is a need for maintaining and tightening the cooperation of the central leading unit with all institutions working in industry as well as more effective participation of this unit in working out and updating the research work plans.
Implementation of the growing activities carried out by the central unit requires further extension of PRDC which is connected with an increase of employment status.
It is also assumed that in 1981-1985 a permament growth of employment in industrial research units will take place.
Effects obtained as a result of project implementation were given in chapter V - "Effects of achievement of immediate objectives".

An example of the achievement of the second long-term objective of the project is the fact that the experience and knowledge gained in the course of project realization are transmitted to the developing countries

by training their specialists on UNIDO fellowships.

Training of fellows from the developing countries takes place in PRDC and other packaging branch laboratories in Poland.

Up to now during the period 1978 - 1980, 16 fellows were trained on individual fellowships.

These fellows came from:

| | |
|---|---|
| India | - 9 |
| Morocco | - 5 |
| Cuba | - 2 |
| Total | -16 |

Moreover 4 experts from Poland were assigned by UNIDO as packaging specialists in newly-established packaging institutes in such developing countries as: Cuba, India, Iran, Jamaica, Pakistan, Turkey.

In the nearest future training activities will be continued but in a form of residential courses and symposia for specialists from the developing countries.
Proposals in this matter were submitted to UNIDO in June 1980 and a possibility of their implementation is the subject of negotiation.

The achievement of long-term objectives of the Project -
- development of scientific-research basis,
- utilization of the achievements of the project including technical and staff qualification aspects in order to transfer the knowledge and experience to the developing countries will be continued.

However, it should be stressed that the achievement of planned objectives will strictly depend on the economic situation of our country.

## IV OUTPUTS OF INVESTMENT, RESEARCH AND TRAINING ACTIVITIES

### 1. INVESTMENT ACTIVITIES

Within the implementation of the Project DP/POL/77/001 the experimental-production part of the Packaging Demonstration Plant in Białystok was built up. Investment costs amounted to 343,504,562 zlotys, i.e. 98 per cent of the value planned in the Project.

Considering the general economic situation in Poland the construction of the II Stage of Demonstration Plant was delayed. It is planned that the completion of the II Stage will take place in 1981.

Because of a big demand for packages it was decided to start temporarily the production of multilayers in the existing buildings. At present all machines have been already installed and raw materials for multilayers production (part of Polish origin and part from imports - poliamide and adhesives) are at site.

Specialists responsible for putting machines into operation and for laminates production were trained and now the staff of the Demonstration Plant is being trained in machines operation, technological process and quality control.

The technology for laminates production ( printed and unprinted laminates) concerning the laminating process was worked out by the group of specialists from PRDC. The technological specification on the laminates production was transmitted to the Demonstration Plant in December 1980.

According to the plan it is foreseen that in 1981 the production capacity will be ca 1700 tons of web laminates and ca 400 tons of printed bags made of laminate. Part of laminates will be used for thermoforming.
The laminates manufactured in the Demonstration Plant will be applied for packing foodstuffs but laminates in a form of web will be used for packing products on automatic machines and a part of them for packing medical accessories. Bags made of laminates both printed and unprinted will be used according to the current needs of the market but mainly for packing foodstuffs. Products will be packed in bags on two-chamber vacuum machines.

In the period 1977-80 the total funds spent for the purchase of equipment and spare parts from the Polish contribution amounted to 185,056,000 zlotys which makes 85 per cent of the planned value. This is not a fixed figure and it can be changed because the investment is not terminated as yet.
However, to make it clear, it should be added that the total Polish contribution in equipment component will be lower than that planned in the project document because in the course of Project implementation one of the technologies concerning self-adhesive labels production in the Demonstration Plant was cancelled. Following this decision the purchase of equipment for the manufacture of self-adhesive labels was stopped.

From UNDP side a sum of $ 187,038 was spent for the purchase of equipment. It makes 132 per cent of the value planned primarily in the project document. As a result of endeavours made by the UN-UNDP Programme Bureau, UNDP decided to increase funds in the equipment component by ca. 46,000 dollars in order to equip the training Centre at Białystok with additional training facilities taking into consideration the possibility of implementation of one of the long-term objectives of the Project, i.e. creation of scientific-research basis for establishing cooperation and giving assistance in packaging to the developing countries.
Equipment delivered within the project is utilized in the elaboration of scientific-research projects covered by the work plan and others contracted directly by industry, in making expertises and giving quality certificates for packaging

materials and packages. All contracts and analyses carried out on equipment delivered from UNDP funds allowed for elimination of packages which were not manufactured properly. A result of it was diminishing losses amounted to 6 million zlotys annually.

## 2. RESEARCH ACTIVITIES

According to the project document research activities undertaken in the course of project duration should mainly concentrate on:

- the progress in production of packaging materials and packages for food products both for the home market and export.
- improvement of the quality of packages and packaging materials in order to decrease the import and losses of the packed products.
- improvement of efficiency of utilization of raw materials and machines applied in the production of packages, particularly for foodstuffs and packaging recycling problems,
- adaptation of packages to the requirements of modern transport and storage techniques in national and international trade,
- scientific-technical information in packaging.

Research activities were implemented 100 per cent according to the Project Work Plan (see Annex No. 4 ).

The scientific-research projects carried out within the project contributed to a great extent to:

- elaboration of a number of new technologies and establishing production of packaging materials and packages from indigenous raw materials, for example the production of laminates in the Demonstration Plant at Białystok will contribute to the decrease of imports (effects are

presented in another chapter of this report),
- increase of the marketing value of packages,
- unification of packaging dimensions, adaptation of dimensions of consumer packages to the dimensions of transport packaging and in consequence development of rational containerization and palletization,
- decrease of consumption of packaging materials originated from such raw materials as wood and metals.

## 3. TRAINING ACTIVITIES

During the project implementation 4 experts' consultations took place (see Annex No. 5).

i/ Mr.Horst J.Wolfrum (FRG) - senior expert participated in all works connected with the planning and implementation of the project. Moreover he advised the fish industry in the field of packages for fish and fish products.

ii/Mr.Bennie Hansen (Sweden) - expert in environmental protection against packaging waste pollution. He assisted in the work connected with organization and economic effectiveness of packaging waste utilization considering recycling and other methods of packaging waste disposal.

iii/Mr.Longin Placzek (FRG) - expert in manufacture and application of consumer and transport packages made of treated board. His assistance concerned production, tests and application of packaging materials such as treated board used mainly for the manufacture of packages for foodstuffs as well as anti-corrosion packages.

iv/ Dr Luis Sicre (Spain) - expert in organization and methodology of training in packaging.

According to the project there were also planned fellowships for research staff and designers in the field of testing, designing, manufacture and application of modern packaging

materials and packages. In the period 1978-1980 24 fellowships and 3 study-tours were organized ( 26 fellowships were planned, out of which 1 was cancelled and one is to be organized in 1981). List of fellowships and study-tours is presented in Annex No. 7. Subjects of training were closely connected with research work carried out by all institutions participating in the project. Effects are presented in the chapter "Effects of implementation of immediate objectives of the Project".

## 4. ACTIVITIES OF THE TRAINING CENTRE AT BIALYSTOK

The Training Centre was set up on 6 September 1977 by the decision of the Minister for the Materials Economy. Training activities started in 1978. During the period 1978-1980, 15 packaging courses were organized. In these courses 484 participants took part. They were mainly representatives of the medium technical level (see Annex No. 11) According to the general economic trend the subjects of training concentrated on the problems of production of plastic packages. Training covered both subjects connected with economics, organization of production and technological processes, machines operation, transport, marking, standardization, packaging waste recovery and recycling, graphic design, printing problems and safety and hygiene of work.

The programmes of training were elaborated by the staff of PRDC in consultation with other institutions organizing these courses. They were: Quality Inspection Office from the Ministry of Foreign Trade and Shipping, Ministry of Chemical Industry, Central Union of Food Cooperatives, Ministry for the Materials Economy, Research-Construction Centre for Machine Tools.

The majority of lecturers came from the PRDC (60 per cent). Others were from the Packaging Demonstration Plant at Białystok (20 per cent), organizers ( 10 per cent) and others

(ca. 10 per cent) e.g. from the National Packaging Centre, Ministry for the Materials Economy, Research-Development Centre for Railway Technique, Enterprise for Internal Transport and Shipment and such unions as: Plastofarb, Pollena, Polfa etc.

In order to make the full use of the existing facilities (equipment and hotel) the Training Centre, apart from packaging courses, organized also symposia, conferences and other forms of training for different institutions. It should be emphasized that in connection with a difficult economic situation in our country and often a lack of raw materials the rate of the development of the packaging industry was restrained. As a consequence of such a situation, the demand for training courses in this field is at present lower than it was foreseen at the beginning of the seventies when an idea of setting up the Training Centre appeared.

In the future according to the long-term objective of the Project, apart from courses arranged for the national packaging producers and users, the Centre will organize training in the packaging field for the packaging specialists from the developing countries. The proposals in this matter were submitted to UNIDO by the Polish Authorities The Permament Representative of Poland to UNIDO in Vienna. It is also planned to organize there seminars and symposia on packaging problems with participation of national and international experts.

## V ACTIVITIES CARRIED OUT AND OUTPUTS PRODUCED

| Immediate objective | Research activity | Executing institutions | Fellowships | Equipment | Experts | Remarks |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I Development in packaging materials production to meet the needs of food-processing industry both for home market and exports | 1.1 Elaboration of production techniques for laminates with plastic films | PRDC Warsaw | a/. Testing and evaluation of changes in packaging materials utility value and evaluation of their quality changes in the process<br>G. Westerowicz<br>29.IX - 15.XII 1978<br>Sweden | | The post of Senior Expert- Horst Wolfrum | |
| | 1.2 Adaptation of packaging materials to the requirements of packaging machines | PRDC Warsaw | a/. Modern technological and organizational solutions applied in production of paper packages in printing industry<br>H. Kubera<br>VI-VII 1979<br>Austria | | | |
| | 1.3 Production, use and testing methods for plastic laminates and packages made of them applied for foodstuffs | DP Bialystok | a/. Extrusion and modification of PP, PA, Polyester films used for laminating<br>B.Kuta<br>6.X - 6.XII 1978<br>FRG, Switzerland | Equipment for spot measuring of film thickness<br>Slip testing table<br>Electrometer<br>Oscilloscope<br>Apparatus for the measurement of oxygen permeability through electic materials | | |
| | | | b/. Production technology of multilayer films for packing meat, meat products, cheeses by solvent lamination, coextrusion, coating and lacquering<br>M. Gryżewski<br>21.IX - 15XI 1978<br>FRG, Great Britain | | | |
| | | | a/. Testing Methods for multilayer films. Technological and laboratory selection of films under consideration, their compatibility with products and packing machines<br>M. Kopycińska<br>7.V-11.V.1979<br>FRG, U.K. | Laboratory heat sealer type Kopp | | |
| | | | d/. Organization and management of research institutes and enterprises which manufacture packaging materials and packages<br>J. Lekszycki<br>S. Nowacki<br>Wł. Burcicki<br>X.1979<br>FRG, Austria, Italy | | | |
| | 1.4 Packaging systems for foodstuffs with the use of plastic laminates | | cancelled | | | |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| | 1.5 Determination of suitability of plastic packages for fish and fish-processing products | CLFI Gdynia | a/. Packages made of plastics, paper, board and fibreboard for fish and fish-processing products<br>G.Ornat<br>16.X - 2.XI.1978<br>Finland, U.K. | | Hans J. Wolfrum Expert in selection of packages made of plastic films and laminates as well as of coated paper and board for fish and fish-processing products | |
| | 1.6 Determination of suitability of modern metal packages with various protective coatings for fish-processed products | CLFI Gdynia | a/. Technological and technical conditions for the production of fish preserves packed in flexible and glass packages<br>B. Markowski<br>FRG, France<br>III.1981 | Set for testing and measurement of end (double seam in metal cans). | | Under implementation |
| II Better adjustment of packaging production to the growing demands of the home market which result from increased consumption and living standard of the population | 2.1 Testing methods and quality evaluation criteria for packaging materials and packages | PRDC Warsaw | a/. Methods for testing migration of packages and packaging material components to packed foodstuffs<br>W. Serzyński<br>9.X - 30.XI.1979<br>Austria - Sweden | | | |
| | 2.2 Modification of packaging materials through coating on one-side and two sides | PRDC Warsaw | a/. Testing of packaging materials and evaluation of their quality changes in the process<br>G. Nestorowicz<br>29.IX - 15.XII.1978<br>b/. Manufacture and conversion of cellophane<br>M. Pijarczyk<br>1.X. - 1.XII.1979<br>Austria, France | | | |
| | 2.3 Designing of packaging processes and packages | PRDC Warsaw | a/. Designing of techniques for packing foodstuffs into consumer packages with particular consideration to the extension of product shelf-life<br>S. Kierkus<br>III - IV.1979<br>FRG, Sweden, Denmark<br>b/. Designing of transport packages and packing processes<br>M. Kasprzyk<br>5.XI - 30.XI.1979<br>France | | | Ad.2.3 c/Organization of designing enterprises engaged in constructional design of package and packaging techniques<br>St.Krogulski<br>P.Kłosiewicz<br>E.Bielski<br>H.Norwisz<br>M.Feldman<br>Finland, Sweden Denmark, France<br>19.XI.-9.XII. 1978 |
| | 2.4 Standardization of consumer packages made of plastics regarding their dimensions, requirements and testing of particular packages types | PRDC Warsaw | a/. Standardization of technical parameters for consumer, multiple and transit packages<br>Z. Mazur<br>7.X - 15.XI.197?<br>FRG, Austria | | | |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| | 2.5 Elaboration of production techniques for coating paper and board with hot-melts and for manufacturing packages of these materials particularly taking into account the needs of anti-corrosion protection | PPRI Łódź | a/. Production technology for consumer packages for foodstuffs as well as consumer and transit packages for metal products considering anti-corrosion problems<br>A. Bednarek<br>6.V - 9.VI.1979<br>Sweden, FRG, Finland<br>b/. Temporary protection and packaging materials used for the protection against corrosion. Methods for anti-corrosion packing of metal products<br>J. Zawadzka<br>16.III - 6.V.1978<br>FRG, Austria<br>c/. Production technology for paper and paperboard coated with hot melts and used for the manufacture of consumer and transit packages for foodstuffs<br>I. Graczyk<br>29.IX - 8.XI.1980<br>Sweden, Finland | Heating pistol for shrink film wrapping of palletized loads<br>Slotting machine for corrugated fibreboard | Longin Płaczek Expert in manufacture of consumer packages made of treated board and transit packages | |
| III Improvement of the quality of packages and packaging materials in order to decrease their import as well as losses of the packed products in internal trade | 3.1 Investigation on materials influence on quality and shelf-life of foodstuffs from the point of view of optimization of package protective functions | PRDC Warsaw | a/. Manufacture, conversion and application of treated packaging materials based on laminates<br>B. Czerniawski<br>VI.1980<br>FRG, Switzerland, Netherlands<br>b/. Designing of techniques for packing foodstuffs into consumer packages with particular consideration of the extension of product shelf - life<br>S. Kierkus<br>III-IV.1979<br>FRG, Sweden, Denmark<br>c/. Methods for testing migration of packages and packaging material components to packed foodstuffs<br>W. Sarzyński<br>9.X - 30.XI.1979<br>Austria, Sweden<br>d/. Production of modified packaging materials for the food industry<br>S.Matyaszczyk<br>11-X 1978<br>FRG | Laboratory laminating machine Dixon | | |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| | | | e/. Application of modified and treated packaging materials based on plastics<br><br>W. Małaśnicka<br>7.V - 11.VI.1979<br>FRG | | | |
| | | | f/. Testing of packaging materials and evaluation of their quality changes in the process.<br><br>G. Nestorowicz<br>29.IX - 15.XII.1978<br>Sweden | | | |
| | | | g/. Getting acquainted with the principles of installation, erection, construction and with the principles of maintenance and technical service of laboratory laminating machine<br><br>J. Gościcki<br>A.Kuzia<br>1.III - 21.III.1979<br>Great Britain | | | |
| IV Adaptation of packages to requirements of modern transport and storage techniques in home and international trade | 4.1 Adaptation of packages and unit loads to the requirements of modern transport and storage techniques | PRDC Warsaw | a/. Designing of transport packages and packaging processes<br><br>M. Kasprzyk<br>5.XI - 30.XI.1979<br>France | | | |
| | | | b/. Designing of unit loads taking into account modern transport and storage methods<br><br>J. Remin<br>26.VIII - 7.X.1978<br>FRG, Switzerland | | | |
| | | | c/. Organization and principles of rational handling of returnable packages<br><br>K. Albigowska<br>6.VI-20.VII.1979<br>Sweden | | | |
| | 4.2 Implementation of flexible containers for the transport of dry goods | | a/. Study tour: St. Jakowski<br>T. Pulczyński<br>W. Mokrzycki<br>and others<br>9.X - 29.X.1977<br>FRG, Austria, France | Additional table for compression tester | | |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| | 4.3 Co-ordination of dimensions of packaging materials, forming and packing machines, packages as well as transport and storage means. Analytical research work, draft standards | PRDC Warsaw | a/. Standardization of technical parameters for consumer, multiple and transit packages<br>Z. Mazur<br>7.X - 15.XI.1979<br>FRG, Austria | | | |
| V Packaging waste handling | 5.1 Utilization of plastics packaging waste as a factor of the protection of natural environment | PRDC Warsaw | a/. Methods for packaging waste utilization from the viewpoint of environmental protection<br>F. Struś<br>18.X - 15.II.1979<br>Switzerland<br>b/. Organization and economic efficiency of packaging waste recycling and rational methods for their annihilation in view of forecasts of packaging industry development and environmental protection against pollution by packaging waste<br>St. Szczepański<br>16.VIII - 18.X.1978<br>Sweden, Austria, FRG | | B. Hansen<br>Expert in environmental protection against pollution by packaging waste covering also the possibility of recycling | |
| VI Scientific and technical information in packaging field | 6.1 Modern methods of the preparation of scientific, technical and economic information in packaging field | PRDC Warsaw | a/. Modernization of methods for the preparation of scientific, technical and economic information in packaging field<br>J. Łembrzuski<br>26I - 11.III.1978<br>Great Britain | | | |
| VII Organization of training | | PRDC Warsaw | a/. Methods and organization of training in packaging field<br>K. Kiełbiewska<br>VIII.1979<br>Austria | 16 mm projector screen for day light<br>Overhead Projector<br>Kodak Carousel Slide Projector<br>Exposure-meter<br>Simultaneous Interpretation System | L. Sicre<br>Expert in organization of training for packaging specialists | |

## VI EFFECTS OF ACHIEVEMENT OF IMMEDIATE OBJECTIVES OF THE PROJECT

### A. Development in packaging materials production to meet the needs of food processing industry both for home market and exports

1. Elaboration of production technology of multilayers for vacuum packing. It will be introduced in the Packaging Demonstration Plant at Białystok. This work was done in PRDC instead of purchasing know-how abroad which allowed for a saving of 45.5 million zlotys. Final production capacity of multilayers will achieve 2500 tons valued ca. 370 million zlotys. In case of imports of such quantities of laminate the costs will amount to 6.25 million dollars.
2. Elaboration of production technology of film with higher absorption of UV radiation - savings are 1.5 million zlotys.
3. Elaboration of production technology of PE film suitable for mechanical packing. Savings obtained amount to ca. 2.25 million dollars (stopping import).
4. Application of a special type of film - so-called "Blenden" instead of shrink film for multipacks contributed to make 20 per cent savings of materials as a result of the difference in film thickness. After introducing 1000 tons of "Blenden", film savings will achieve 6 million zlotys.
5. Initial stage of elaboration of new methods for marking the vinyl chloride in polyvinylchloride materials manufactured in Poland. This subject is closely connected with establishing production of polyvinyl chloride for packing foodstuffs.

6. On the basis of research carried out it was possible to define application possibilities of:

   - packages thermoformed from imported Polyurethan film as a supplementing of Polish made PVC for packing ready-to-serve fish products,
   - indigenous steel electrolytically tinned with reduced and differentiated thickness of tin on both sides,
   - new Polish and imported lacquers for built-in cans for fish industry,
   - Polish sealing compounds for round lids (up to now only imported compounds were used).

7. Production tests were done on defining the possibility of application of hot-melts instead of imported adhesives for closing carton board boxes on "Kliklok" machines (introduction will take place in 1981).

8. Investigation studies were made on substitution of cheaper dehydrating agents e.g. bentonites for silica gel. It will bring savings in materials costs ca.8 times.

9. Application of Polish made foam polystyrene for manufacture of moulds with higher volumetric weight - planned savings - 2.7 million zlotys annually.

B. Better adjustment of packaging production to the growing demands of the home market which results from increased consumption and living standard of the population

1. It is planned to increase cellophane production from 7.500 tons to 10.000 tons yearly owing to the reducing of film from 40 $g/m^2$ to 30 $g/m^2$. It was possible to increase the capacity through constructing in Poland 3 modern high speed machines and installing them in the Cellophane Factory as well as through the improvement

of the quality of spinning and constructing machines for lacquering.
Reducing the cellophane thickness will allow for an increase of packaging materials by 25 per cent without any increase of raw materials consumption. The planned growth of cellophane due to reducing its thickness and improvement of its quality will in the future result in stopping import of this packaging material.

2. Elaboration of production technology of printed multilayers using solvent adhesives for the needs of the pharmaceutical industry. Production capacity of 80 tons in 1980 gave savings of 0.3 million dollars (value of imported films).

3. Elaboration of production technology of bags for sterilization of medical instruments. It will contribute to the improvement of safety and hygienic conditions as well as asepsis in hospitals.

C. Improvement of the quality of packages and packaging materials in order to decrease their import as well as losses of packed products in internal trade

1. In the period 1979-1980 R and D work related to testing methods and criteria of quality assessment of packaging materials and packages was carried out. As a result of this work there were defined requirements concerning quality of PA/PE laminates manufactured in Poland, requirements for paper used for automatic packing of sugar, for thermosealed cellophane used for packing on automatic machines, for paper and jute sacks, corrugated board cases, wire cases, steel drums with detachable covers and light construction, overprints on packaging materials and packages. These studies contribute to a great extent to the improvement of quality of packaging materials and packages as well

as to diminishing losses of packed products.

2. The problem of improving quality of packages and packaging materials played a significant role in standardization and design work aimed at modernization of construction and production of packages.

3. Elaboration of identification method of flavour components in packaging materials allowed to define the correlation between the results of sensorial and chromatographic methods through the introduction of an indicator of potential contamination of product by the odour of packaging material. Results of these tests are applied in determination of quality standards for packaging materials newly introduced into the production process. There exists also a running control of the content of aromatic substances in packaging materials during the production process on orders of national producers.

4. There exists a possibility of surface modification of PP film using a method of applying a thin layer of crosslinking adhesive. A recipe for lacquers for coating oriented PP film has been also elaborated.

5. Tests were carried out and results of tests were given to the fish industry. These tests concerned possibilities of application of packaging materials with better packing capacity for vacuum packing of salted fish. It relates to imported multilayers manufactured by coextrusion where thickness is lower than in case of laminates.

6. The definition of indicators of quality requirements for packages made of multilayers, boxes made of coated carton board for frozen fish, board boxes for packing frozen blocks of fish and elaboration of the methodology and introduction of packing control will contribute to a great extent to the decrease of losses of materials and packed products as well.

7. Research was undertaken on the technology of modification of packaging materials based on paper, carton board and fibreboard using hot-melts.

D. Improvement of the efficiency of use of raw materials applied to the production of packages, particularly for foodstuffs

1. An analysis of updating standards concerning Packaging Modulus Systems and amendments of standards contributed to the decrease of consumption of such raw materials as steel, paper and fibreboard.

2. Introduction of a transportation of powdered products in flexible containers will result in a decrease of paper and film consumption giving savings of 92 million zlotys annually.

3. Introduction of V-tube process for packing fruits and vegetables in plastic films on Lockwood machines will bring following effects:

   80.000 zlotys during 1978-1979

   1 million zlotys during 1979-1980

4. Introduction of new method of packing glucose and granovite on Transwrap machine will bring savings of 1.5 million zlotys.

5. Introduction of packing sugar and flour on Transwrap machines will bring savings of 800.000 zlotys.

6. Due to modernization of metal drums construction (200 litres capacity) it was possible to reduce their weight by 30 per cent. Raw materials saving amounts to 10 million zlotys yearly owing to the reduction of steel consumption.

7. Studies on economic effectiveness of packaging recycling

and utilization of plastics waste will contribute to the considerable reduction of a consumption of raw materials during the production process of packaging materials and packages.

E. Adaptation of packages to requirements of modern transport and storage techniques in home and international trade

1. Standardization work was aimed at the adaptation of packages to the requirements of modern technique of transport and storage. During the period 1976-1980 a number of standards on packaging dimensions for bottles, boxes, cups and sacks were elaborated.

   For example in 1978 an amendment to the standard on Packaging Modulus System was made.
   Standardization activities contributed to a great extent to the unification of packaging dimensions and the introduction of rational palletization and containerization.

2. Adaptation of packages to the requirements of modern technique of transport and storage was also considered in construction work. Within these activities guidelines were prepared for industrial plants preparing the despatch of goods in a form of palletized unit loads.
   A verification of construction of actually used cases was done. Work in this field concerned an elaboration of new principles for calculation of cross-section of wooden elements of cases.

3. A proposal concerning the substitution of unit loads for transport packages - boxes made of corrugated fibreboard was prepared. These units are formed with pallets, multi-unit trays made of fibreboard and PP tapes for binding. Economic effects resulting from decrease of

packaging costs amounted to 1 million zlotys in 1979.

4. Tests on suitability of thin chipboard for production of transport packages were carried out.

5. A technical analysis of production and application of cylindric steel transport packages, wire containers and pallets was done.

6. In order to introduce a transport of perishable products cooling containers the principles of laying out and fixing loads in containers were worked out.

7. A new construction of flexible container, sealed with circular section and capacity of $1m^3$ was elaborated.

8. As a result of the study-tour organized to Austria, France and FRG in 1977 priority indications related to application of flexible containers were defined. The technical and organizational indications concerning the introduction of transport of selected products in flexible containers were elaborated. For example introducing flexible containers instead of transport of goods in sacks will eliminate 45.5 million of paper sacks valued ca. 250 million zlotys and 34.5 million of PE film sacks valued ca.240 million zlotys. Savings resulting from introducing containerization will amount to 92 million zlotys annually apart from significant benefits caused by the reduction of transport and handling costs.
   An introduction of transport of goods in flexible containers will also contribute to:
   - reduction of losses of powdered products during the transport by ca. 90 per cent,
   - increase of effectiveness of utilization of transport means as a result of shortening of standstills by 30 per cent.

9. A new system of packing furniture elements in unit load packets was also introduced. It contributed to the modernization of transport technique and decreased losses and facilitated handling giving savings of 2.5 million zlotys yearly.

## VII FINDINGS

The main long-term objectives of the Project are:

1/ Consolidation of the development of necessary scientific and technological support for packaging industry with the strengthening of the central research and development base as well as with the subsequent development of relevant industrial laboratories involved in packaging for meeting the requirements of the food-processing industry on national and international levels.

2/ Creation of research and development basis for establishment of a close cooperation between Poland and developing countries and rendering them assistance in the packaging field on the basis of the achievements of Project.

The achievement of the first long-term objective was mainly connected with a new role of PRDC towards other institutions involved in packaging which means that PRDC was given an authority to coordinate all research and development work carried out in packaging laboratories in Poland as a part of so called "branch-problem" entitled: "Modernization of packaging production and increasing the efficiency of packaging and packaging materials utilization in the national economy".
Since the Government provided PRDC with money for payment for the work done to other participating branch laboratories, through such financial assistance PRDC encouraged industry for close cooperation and strengthened its coordinating responsibility.
The branch problem was approached during the period 1976-1980 and research and development work covered by this problem involved 25 institutions in its implementation. Realization of the subject included in the "branch problem " allowed to define directions of R and D work and coordination

of these activities in all research industrial laboratories. Moreover apart from effects presented in the chapter "Effects of achievement of immediate objectives of the Project" implementation of the"branch problem" contributed also to the strengthening of PRDC role and improving cooperation both with branch laboratories and industrial plants.
It should be noted that PRDC in the period of "branch problem" realization operated on a contract work basis, that means, that all research, design activities and expertises were contracted and financed by industry.

Below is a quantitative implementation of R and D tasks carried out in close cooperation with industry.

| 1976/77 | 1977/78 | 1978/79 | 1979/80 |
|---|---|---|---|
| 20 | 24 | 26 | 34 - (research projects) |

These are only subjects worked out with the "branch problem".

Apart from this work PRDC made in 1978, 220 expertises (19 on packaging design), in 1979 - 181 expertises (23 on packaging design projects) and in 1980 - 150 expertises (12 on packaging design projects)- and 206 technical ones. In the field of standardization PRDC in the period 1976-80 worked out 81 subjects, i.e. 68 standards and 13 analytical subjects. Within these activities 12 standards were introduced in Poland and 21 standards are foreseen to be introduced by 1983. At the same period 11 amendments to ISO standards were made, out of which 4 ISO standards were introduced into the Polish economy.

A table presenting a growth of the value of packaging deliveries into the Polish economy, illustrates the improvement and influence of the project implementation on the packaging industry.

| Years | Value of packaging deliveries from indigenous sources | Value of packaging deliveries from import |
|---|---|---|
| | in billion zlotys | in million dollars |
| 1975 | 27.7 | 121.7 |
| 1977 | 32 | - |
| 1978 | 37 | 115.1 |
| 1979 | 39 | 115.1 |
| 1980 | 40 | 115.1 |

Individual fellowships implemented within the Project were also of essential importance for the strengthening of the central research unit. They brought such effects as acceleration of working out particular research subjects as well as direct introduction of research work results into production of packages and packaging materials for foodstuffs. A direct result of these activities was a closer cooperation between PRDC and industry. Some fellowships were designated for the representatives from industry - factories and branch laboratories.
The implementation of fellowships and equipment for research and experimental work delivered by UNIDO was of special importance for the progress in research work, technical modernizations and new technological solutions.

Actually PRDC initiated to establish the new "branch problem" entitled:"Increase of effectiveness of packaging manufacture and application" in order to improve the cooperation with industry and to diminish hard deficit of packaging materials as well as to decrease the consumption of energy in their production, to introduce

new modern production techniques, to modernize organization of trade, transport and storage. It is planned to implement the "branch problem" during the period 1981-1985.

It will be coordinated by the PRDC and particular subjects will be worked out partly in PRDC and partly in branch industrial institutions. The implementation of the "branch problem" will be directed towards production economics and utilization of indigenous raw materials in order to limit import of packaging materials.

The"branch problem" involves six subject groups.
They are as follows:

1. Optimalization of production technology of packaging materials from the view-point of requirements concerning modern packaging techniques and reduction of materials consumption.
2. Optimalization of packing techniques and packaging construction from the view-point of proper protection of packages and reduction of materials consumption.
3. Studies on reduction of material losses during the packing process.
4. Adaptation of packages and unit loads to the requirements of modern transport and storage techniques.
5. Forecasting of packaging development and recycling problems of packages and packaging materials.
6. Criteria of quality control and testing methods of packaging materials and packages.

Before proceeding to describe further conclusions resulting from the project implementation it should be stated that it creates appropriate conditions for an approach towards the second long-term objective of the project, i.e. entering into cooperation with the developing countries and rendering them assistance in the packaging field.

Some activities in this field have been already undertaken. These were activities of organizational and technical nature.

To the organizational activities belong:

- setting up the Training Centre in Białystok,
- establishing Demonstration Plant in Konstancin near Warsaw,
- creation of the new "branch problem" where research and development work involves branch laboratories, industrial plants, technical and economic universities connected directly or indirectly with packaging problems,
- increase of employment in PRDC and branch units in industry.

Technical activities are:

- training of research staff - engineers and economists in foreign laboratories and plants manufacturing high quality packages and packaging materials,
- equipping research-development institutions, mainly the central research unit with specific research equipment which allows to improve the quality and to accelerate elaboration of research and application subjects and expertises,
- equipping the Training Centre in training and teaching aids, especially considering training for foreigners as well as improving the standard of lectures,
- carrying out R and D subjects according to the work plan of the Project Document and research programme of PRDC which are substantially connected with the immediate objectives of the Project DP/POL/77/001.

An analysis of immediate objectives achieved throughout the duration of the Project (for details see chapter "Effects of achievement of immediate objectives")

leads to the following conclusions:

1. A progress in modification of packaging materials was started. First of all it concerns plastics and paper used for packing foodstuffs.
2. A substitution of packaging materials manufactured in Poland for imported ones was undertaken.
3. There was noted a systematic improvement of packaging quality and better utilization of raw materials and machines achieved through a number of undertakings of organizational and technical nature, e.g.
   - setting up Packaging Design Office at the seaside,
   - issuing packaging quality certificates,
   - improving the standard of technical expertises due to utilizing modern research equipment.
4. Utilization of results of standardization work in wider range.
5. Modernization of transport and storage techniques through unification of packaging dimensions, palletization and containerization.
6. Work relating to recovery of production waste was started and the range of work on recycling problems was extended.
7. Systematic training of packaging staff from industry is conducted in the Training Centre at Białystok.

## VIII RECOMMENDATIONS

The analysis of the Project achievements and especially conclusions resulting from the achievement of immediate and long-term objectives allows to formulate the following recommendations:

### A. Recommendations of organization and technical nature

1. To establish pilot packaging industry based on selected plants in basic industrial sectors representing following branches in the packaging field:
   - glass
   - plastics
   - paper and board
   - wood
   - metal
2. To allocate 20 per cent of the potential of PRDC and that of scientific-research laboratories for doing basic research work and the rest for the development work mainly for the needs of food industry.
3. To strengtehn the potential of those departments of PRDC which will offer their services to the basic departments, i.e. Coordination, Information, Standardization and Economic Studies Departments.
   These departments will carry out detailed analyses of the situation in packaging in particular branches of industry in comparison to highly developed countries and elaborate immediate and long-term development plans.
4. To work out economic analyses of production profitability of selected packaging materials and packages.
5. To elaborate an organizational-technical project of packaging waste utilization considering first of

all economic and environmental protection aspects.

6. To accelerate establishing of computerized system of scientific-technical information in order to make all packaging abstracts available for institutions interested, especially for the needs of industry.

7. To set up a group of experts who will elaborate actually useful training programme for national training and a programme of courses and teaching materials for training specialists from the developing countries in the packaging field.

8. To elaborate, in cooperation with the Planning Commission and UNIDO a programme of cooperation with selected developing countries in the field of training and technical-economic consulting in the field of packaging.

## B. Recommendations of technical nature

It is necessary to continue the extension of development of scientific-research basis through the growth of employment, upgrading staff qualifications and equipping the institutions involved in packaging problems with modern equipment for testing, control and measurements and to undertake such tasks in the basic branches which first of all are aimed at meeting the needs of food industry.

These tasks are as follows:

### In the paper industry

1. Improving the quality of basic packaging materials and packages made of paper and board to ensure the homogeneity of quality of paper for packing

products on high speed automatic machines.

2. Establishing and developing production of coated paper and carton board for packing foodstuffs, cosmetics and pharmaceuticals.

3. Employing graphic artists additionally to designers working in design offices in order to improve the graphic design of paper packages.

In the glass industry

1. Acceleration of the modernization of packaging glass factories in order to update technological methods and to reduce the weight of glass containers maintaining good mechanical resistance and dimensional accuracy.

2. Introduction of new functional types of glass containers meeting the requirements of high speed packing machines, especially for packing pharmaceuticals.

3. Setting up Glass Packaging Design Office in order to update graphic design, construction and production technology of glass containers.

In the metal industry

1. Increase of the percentage of thin tinplate ( 0.18-0.22 ) in the production process of cans.

2. Working out and introducing tin-free steel coated on its surface as a substitute for tinplate.

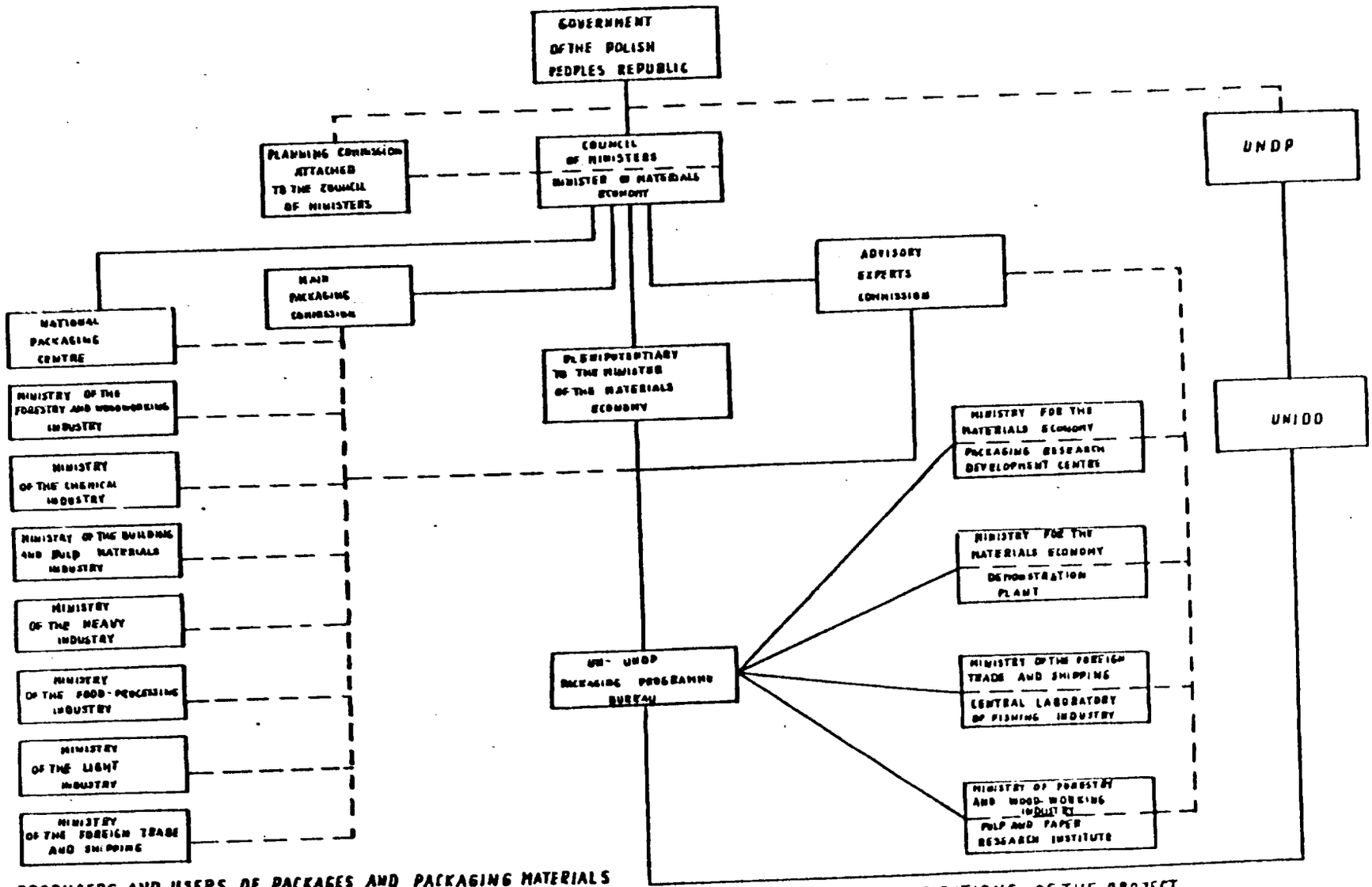
3. Acceleration of the development of production of traditional transport packages with modernized construction, e.g. drums, hobbocks, wire containers.

In the chemical industry

1. Establishing production of Polyvinyl Chloride where the content of vinyl chloride monomer amounts to 1ppm. Such a content is admitted by the health authorities for direct packing of food products. Application of the Polyvinyl Chloride will allow to diminish import of this material used in the food industry.
2. Developing production of sealing compounds for bottles and jars closures which allow to carry out sterilization of food products.
3. Establishing production of hot-melts applied for coating packaging materials and closing boxes on automatic closing machines.
4. Establishing production of poliamide suitable to the manufacture of multilayers. It will contribute to stopping import of this material which will be based on raw materials of the Polish origin and used for packing food products.
5. Establishing production of coated and oriented PP film. This film will replace imported heat-sealed cellophane used for the needs of food, pharmaceutical and cosmetic industries.
6. Introducing the modern waste-free production technology of thermoformed packages.
7. Developing production of re-inforced flexible containers.

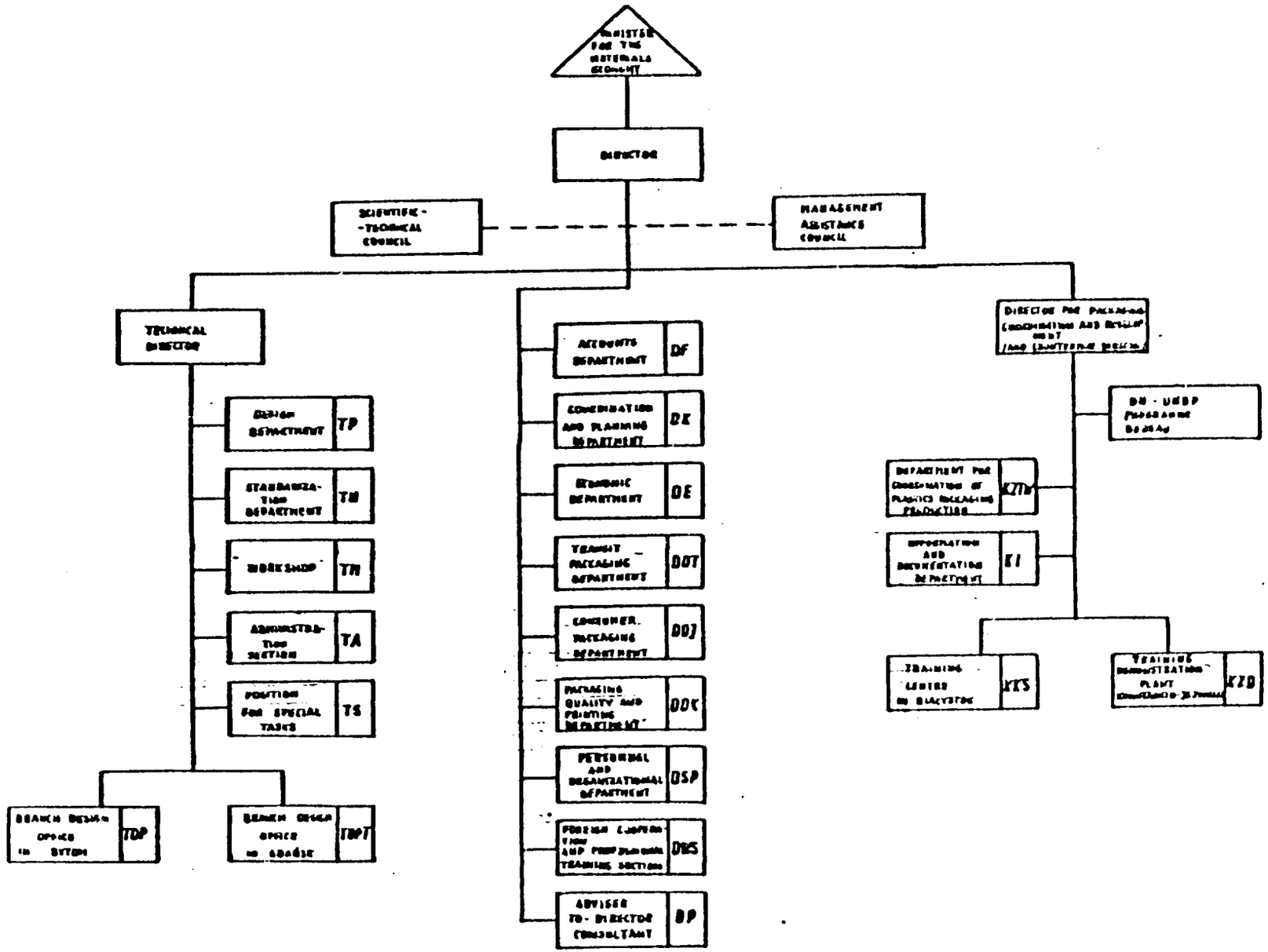
ANNEX 1

## ORGANIZATIONAL STRUCTURE OF THE INSTITUTIONS WHICH ARE DIRECTLY OR INDIRECTLY CONNECTED WITH REALIZATION OF THE PROJECT - DP/POL/77/001



ORGANIZATIONAL STRUCTURE OF THE PACKAGING RESEARCH AND DEVELOPMENT CENTRE IN WARSAW

ANNEX 2



ANNEX 3

## A list of institutions co-operating with the Packaging Research and Development Centre in Warsaw

| No | Name of institution | Place |
|---|---|---|
| 1. | Demonstration Plant | Białystok |
| 2. | Central Laboratory of Fishing Industry | Gdynia |
| 3. | Pulp and Paper Research Institute | Łódź |
| 4. | Institute for Wood Technology | Poznań |
| 5. | Ceramics and Glass Institute in Warsaw (Branch laboratory in Cracow) | Warsaw Cracow |
| 6. | Plastics Research and Development Centre | Mikołów |
| 7. | Packaging Research and Development Centre "POLLENA" attached to Warsaw Plastics Factory | Warsaw |
| 8. | Meat Industry Research Institute | Warsaw |
| 9. | Laboratory of Food Concentrates | Poznań |
| 10. | Branch Packaging Experimental Centre attached to Plant for Fruits and Vegetable Processing | Włocławek |
| 11. | Research and Experimental Department of Light Industry Plant "Kęty" | Kęty |
| 12. | Metal Can and Research Centre attached to the Union of Metal Can Factories "OPAKOMET" | Cracow |
| 13. | Packaging Laboratory of Pharmaceutical Industry "POLFA" | Warsaw |
| 14. | Research and Development Centre of the Co-operative Printing, Paper and Packaging Industry | Poznań |
| 15. | Institute of Machines for Foodstuffs | Warsaw |
| 16. | Research Development Centre of Packing Machines | Poznań |
| 17. | Industrial Chemistry Institute | Warsaw |
| 18. | Dairy Industry Institute | Warsaw |
| 19. | Non-ferrous Metals Institute. Branch of Light Industry "Skawina" | Skawina |
| 20. | Science of Commodities Institute at Economic Academy in Cracow | Cracow |
| 21. | Science of Commodities Institute at Economic Academy in Poznań | Poznań |
| 22. | Research Development Centre of Rubber and Vinyl Plastics | Oświęcim |
| 23. | Co-ordination Centre of Cooperation among CMEC countries in the field of packaging | Warsaw |
| 24. | Storage Management Institute | Poznań |
| 25. | Institute of Precise Mechanics | Warsaw |

ANNEX 4

Research and Development work carried out within the Project DP/POL/77/001

| No | Subjects according to the Project | Research and Development works elaborated in 1978-1980 by executing institutions of the Project |
|---|---|---|
| 1 | 2 | 3 |
| | | POLISH PACKAGING RESEARCH AND DEVELOPMENT CENTRE IN WARSAW |
| a/ | Elaboration of production techniques for laminates of plastic films. | 1. Elaboration of manufacturing methods for laminates based on raw materials available in Poland.<br>2. Elaboration of production technology for laminates suitable for thermoforming and vacuum packing.<br>3. Analysis of coextrusion suitability for laminates manufacture in Poland.<br>4. Analysis and selection of optimal technological solutions for the implementation of laminates manufacture in the Packaging Pilot Plant at Białystok.<br>5. Elaboration of production technology for printed laminates by dry lamination method (with solvent adhesives).<br>6. Optimization of thickness for laminate layers in laminates that include PA film aiming at decrease of material consumption. |
| b/ | Adaptation of packaging materials to the requirements of packaging machinery and equipment. | 1. Elaboration of production technology for PE film adopted to packing on Polish-made packing machine.<br>2. Determination of electrostatic properties of flexible films applied for mechanical packing in Poland.<br>3. Determination of the quality evaluation criteria for coated paperboard applied in machine-packing of foodstuffs.<br>4. Elaboration of modification method for heat-sealable Polish-made regenerated cellulose film to meet the requirements of high-speed packing machines.<br>5. Implementation of flow-pack method of packing products in heat-sealed films.<br>6. Determination of the requirements for cartons applied in automatic packing of collapsible tubes as well as glass and plastic jars.<br>7. Testing and measurements of paperboard and folding cartons applied in automatic packing.<br>8. Improvement of glass packages manufactured on automatic machinery and equipment. |
| c/ | Testing methods and quality evaluation criteria for packaging materials and packages. | 1. Testing the suitability of new packaging materials. Testing the suitability of thin particle board for application in transport packages.<br>2. Analysis of technical status concerning application of cylindrical, metal packages.<br>3. Testing the suitability of Polish-made HDPE-film for packing of rolling bearings.<br>4. Evaluation of disinfectants applied for transit packages from the point of view of their corrosive influence on exported machine tools.<br>5. Elaboration of testing method for microbiological clearness of the basic packaging materials.<br>6. Elaboration of methods for accelerated testing of shelf-life of packed products containing fats and cereal products. |

| 1 | 2 | 3 |
|---|---|---|
| | | 7. Quality evaluation criteria for condensed and powder milk.<br>8. Quality evaluation criteria for paper of the bags applied for cereal products packing.<br>9. Unification of electro-chemical method for evaluation lacquer coats tightness in tins with preserves.<br>10. Quality evaluation of packages. Indication of optimum technological parameters and quality evaluation methods for paper and bags applied for sugar packing on automatic machinery.<br>11. Quality evaluation criteria for plastic cases for fish.<br>12. Quality evaluation criteria for wire cases.<br>13. Quality evaluation criteria for paper sacks.<br>14. Quality evaluation criteria for jute sacks.<br>15. Indication of quality requirements for Polish-made bands.<br>16. Quality evaluation criteria for tin drums with light construction and removable covers.<br>17. Testing the possibility of improvement physico-mechanical films properties due to radiation. |
| d/ | Modification of packaging materials through coating on one-side and two sides. | 1. Evaluation of suitability for foodstuffs packing, coated and laminated packaging materials.<br>2. Elaboration of the modification method for regenerated cellulose film in order to improve heat-sealing.<br>3. Elaboration of production technology for substances applied for paper coating, based on water dispersion of copolymers of vinylchloride.<br>4. Elaboration of lacquer recipe for packaging film coating based on copolymers of vinylchloride with vinylacetate.<br>5. Elaboration of modification methods for packing coated films.<br>6. Elaboration of plasticization technology of paper for paraffining. |
| e/ | Investigatin on influence of materials on quality and shelf life of foodstuffs from the vier point of optimization of package protective functions. | 1. Investigation on microorganism permeability through packing films.<br>2. Evaluation of selected packages and investigation on their influence on the quality of processing products.<br>3. Investigation on influence of packaging materials on fat products quality.<br>4. Investigation on influence of packaging materials on meat and meat preserves quality.<br>5. Investigation on processes and evaluation of their quality in the system: environment- consumer package - foodstuffs.<br>6. Elaboration of identification methods of aromatic components in packaging materials.<br>7. Investigation on correlation between outputs of chromatographing and sensory testing. |
| f/ | Modern methods of the preparation of scientific, technical and economic information in packaging field. | 1. Elaboration and implementation of computerized information system in packaging field. |

| 1 | 2 | 3 |
|---|---|---|
| g/ | Utilization of plastics packaging waste as a factor of the protection of natural environment. | 1. Review of methods for utilization of plastics packaging waste in view of their economic efficiency.<br>2. Economic efficiency of the raw materials waste recycling for the manufacture of the bottles. |
| h/ | Elaboration of general programme on the whole country scale for packaging waste handling. | 1. Economic efficiency of packaging waste handling and annihilation in view of elaborated forecasts of packaging development and environmental protection against packaging waste pollution. |
| i/ | Designing of packaging processes and packages. | 1. Principles of forming the unit loads for export.<br>2. Determination of the range and requirements for packaging self-adhesive tapes.<br>3. Elaboration of technological process for radio-sets packing.<br>4. Improvement of packing process of aluminium rolls and forming the packages of brass pigs.<br>5. Instructions for designing of wooden transport packages and designs of transport packages for export.<br>6. Elaboration of conclusions aiming at unification and optimization of packing systems, considering the possibility of paper-materials elimination. |
| j/ | Adaptation of packages and unit loads to the requirements of modern transit and storage technology. | 1. Evaluation of economic efficiency of application shrinkable PE film for forming the multiple and transport packages.<br>2. Elaboration of techniques for polyurethane application as cushioning material.<br>3. Elaboration of methods for packing and fastening goods for export in the containers and transport means.<br>4. Determination of hazards affecting loads during continental transport.<br>5. Determination of cryptoclimate in transport packages.<br>6. Methods of reproduction in laboratorial conditions hazards affecting packages and packed products during handling.<br>7. Determination of mechanical hazards affecting loads in air transport.<br>8. Elaboration of laboratorial methods for technoclimatic testing reproducing sea transport and storage. |
| k/ | Implementation of elastic containers for the transport of dry goods (fertilizers, lime, cement). | 1. Programme of flexible containers development in 1981-1985, forecasting till 1990.<br>2. Elaboration of testing methods for mechanical resistance of flexible containers.<br>3. Elaboration of instruction defining principles of machine tools transportation in containers.<br>4. Principles of placing and fastening products in cooling containers. |

| 1 | 2 | 3 |
|---|---|---|
| 1/ | Subject standardization of consumer packages made of plastics regarding their dimensions, requirements and testing of particular package types. | 1. Elaboration of subject standards concerning plastic packages and instruction for export packages. |
| m/ | Co-ordination of dimensions of packaging materials, forming and packing machines, packages as well as transport and storage means. Analytical research work, draft standards. | 1. During 1978–80 analytical research work and draft standards have been elaborated. They concerned standardization of sacks, flexible containers, plastic tubes, bags of PE film. A complex programme of standardization in packaging field in 1981–85 has also been elaborated. |
| | | DEMONSTRATION PLANT IN BIAŁYSTOK |
| a/ | Production, use and testing methods for plastics laminates and packages made of them applied for foodstuffs. | 1. Elaboration of production methods for multilayer films from raw materials available in Poland.<br>2. Analysis and selection of optimum techniques for the implementation of production programme for multilayer films in Demonstration Plant in Białystok.<br>3. Programme for production of multilayer films and packages.<br>4. Technical requirements for sleeves applied for film rolling.<br>5. Elaboration of production techniques for bags applied for the sterilization of foodstuffs and medical instruments.<br>6. Application of Polish foamable polystyrene for moulds with higher volumetric weight.<br>7. Elaboration of film with higher absorption of UV radiation.<br>8. Antistatic film for kinescopes' mask. |
| o/ | Packaging systems for foodstuffs with the use of plastics laminate. | 1. Implementation of flow-pack method for foodstuffs with the application of sealable films.<br>2. Elaboration of packing method for sugar and flour with application of HAS-32 machine. |

| 1 | 2 | 3 |
|---|---|---|
| | | CENTRAL LABORATORY OF FISHING INDUSTRY IN GDYNIA |
| p/ | Determination of suitability of plastic packages for fish and fish-processing products. | 1. Actual opinions and developing work concerning plastics packages.<br>a/ Research work concerning quality and suitability of the following materials:<br>-Polish-made laminate polyamide/polyethylene manufactured according to the techniques for automatic vacuum packing of fish products elaborated in Packaging Research and Development Centre in Warsaw,<br>-imported multi-layer films manufactured by co-extrusion with thiner than actually produced laminates,<br>-thermoformed packages for fish processing products made of imported polystyrene film,<br>b/ Work concerning determination of the indicators for the quality requirements for packages made of multi-layer film, boxes for frozen fish made of coated paper board and boxes for blocks of frozen fish. |
| q/ | Determination of suitability of modern metal packages with various protective coating for fish-processing products. | 1. Actual opinions and developing work concerning packages for Fishing Industry.<br>2. Designing, technical and utility investigation concerning newly-introduced groups of fish-processing products. |
| | | PULP AND PAPER RESEARCH INSTITUTE IN ŁÓDŹ |
| r/ | Elaboration of production techniques for coating paper and board with hot-melts and for manufacturing packages of these materials, particularly taking into account the needs of anticorrosion protection. | 1. Verification of testing methods for fibreboard boxes and indication of proper requirements, evaluation criteria and standards for testing methods.<br>2. Tests concerning manufacture of paper bags with suitable strength requirements which are to be used for automatic packing of dry foodstuffs.<br>3. Methods for testing the synthetic polymers applied for coated paper.<br>4. Tests concerning the packing materials treatment by hot-melts coating based on paper, paper board and fibrboard. |

ANNEX 5

EXPERTS' CONSULTATIONS

| Project No. | Post Description | Expert's name | Country | Fixed date | Place of consultation |
|---|---|---|---|---|---|
| 11-01 | Senior Expert- consultant | Hans I.Wolfrum | FRG | 5.IX-14.XI 1978<br>3.XII-21.XII 1979 | PRDC-Warsaw<br>DP-Białystok<br>PPRI-Łódź<br>CLFI-Gdynia |
| 11-02 | Expert in environmental protection against pollution by packaging waste covering also the possibility of recycling. | Bennie Hansen | Sweden | 3.VII-14.VII 1979 (2 weeks instead of 1 month) | PRDC-Warsaw |
| 11-03 | Expert in production of packages made of plastic laminates for the needs of food industry. | Cancelled | | | |
| 11-04 | Expert in organization of training for packaging specialists. | Luis Sicre | Spain | 18.V-10.VI 1978 | PRDC-Warsaw<br>DP-Białystok |
| 11-05 | Expert in selection of packages made of plastic films and laminates as well as of coated paper and board for fish and fish processing products. | Hans I.Wolfrum | FRG | 18.XI-2.XII 1979 (2 weeks instead of 1 month) | CLFI-Gdynia |
| 11-06 | Longin Placzek-expert in manufacture of consumer packages made of treated board and transit packages. | Longin Placzek | FRG | 2.VI-29.VI 1980 | PPRI-Łódź |

ANNEX 6

## LIST OF RECOMMENDATIONS MADE BY EXPERTS ASSIGNED BY UNIDO TO THE PROJECT DP/POL/77/001

I. 11-01 senior expert, Horst J.Wolfrum
Conclusions and recommendations from expert's report.

5.IX - 14.XI.1978

3.XII - 21.XII. 1979

### i/ General recommendations

1. The basic objective of the project is the consolidation of the development of scientific and technological support for the industry and their relevant laboratories involved in packaging and the strengthening of central packaging research and development activities to meet especially the requirements of food-processing industry for the home market and exports with respect to the growing demands. This requires best adjustment of packaging production to future demands which therefore should be carefully observed and when occasion arises reviewed and changed.

2. Poland as a growing industrialized country does not yet provide a combined national packaging industry which causes some problems in coordination of work - research and manufacturing as well.
Cooperation between the National Packaging Centre on one hand and the various packaging development centres with the leading position of the Packaging Research and Development Centre as a coordinator in this field on the other

hand serves a general idea and basis for an integration with the parts of industry involved in packaging production and converting in the direction of a National Packaging Industry.

3. One of the first steps should consist in strengthening of the effectiveness of PRDC, thereby, that this central unit determines and controls the aiming lines to an utmost limit which of the multifarious developments should be urged on at PRDC and its branch offices as well as other packaging institutions and the industrial laboratories involved in packaging design, development, quality control and mainly with special research objectives which are somehow undeveloped. That might be of great importance to meet the requirements of suitable and good-standard packaging materials and better packages above all for the home market to obtain the objectives of the present Economic Plan.

4. Another important topic is the creation of technical support and cooperation which is expected between Poland and developing countries according to the objectives of the Project.

   Although there is already some preparatory work done, this topic exerts the closest attention. Some important amendments are of urgent necessity, especially with regard to training activities not only for fellowships from developing countries in Poland but also for the training of Polish packaging specialists on all levels. For this purpose there are already premises at the Training Centre in Białystok but beside this Centre there should be also the possibilities of training of graduates from Poland and from abroad in all packaging techniques, converting, research methods etc. theoretically and practically on sophisticated testing and production equipment.

ii/ Specific recommendations

1. PRDC as the coordinator of research and development work in packaging in Poland should indicate the immediate and long-term objectives of development to meet the demand of the market now and in the future and the requirements of reducing most effectively the imports of basic and semi-manufactured materials.

2. It would be desirable to strengthen the potentiality of PRDC with respect to the wide range of activities of this Centre and the already existing authority to issue quality certifications for packages to stop the production of low quality or withdraw low quality packages from the market to avoid heavy losses by integration of the Centre with those institutions of other industrial branches (e.g. POLLENA, POLFA, PRINTING CENTRE, etc.) which are involved in packaging problems only.

3. If by administrative difficulties, the establishing of an integrated packaging industry is not possible now, the integration should be implemented step by step and the first phase might be the creation of a Scientific-Production Centre. This Centre could facilitate the introduction of the results of research work directly to the production on industrial scale and the elaboration of new designs of packages and packing systems. The Scientific-Production Centre could bring the evident effects in national economy through proper utilization of deficit raw materials and adaptation of optimal constructions and technologies.

4. It seems necessary to pay more attention to coordination problems. Good recognition in activities of all these institutions and equipment are the condition for proper utilization of the potential of scientific-research basis in packaging in order not to double the research work and to make use of the personnel skilled in very specific fields.

5. Apart from contacts maintained with industry and its scientific-research basis directly through research departments of PRDC it is necessary to strengthen the activities of the Coordination Department of PRDC to create conditions for continuous and close cooperation.

iii/ Recommendations related to training

1. Training of medium level specialists

There is a necessity to intensify training activities carried out by PRDC and to involve in the training all branches interested in packaging. The main task of PRDC should be to convince the managers of all institutes, laboratories and factories involved in packaging about the importance of packaging for the national economy.
PRDC should change organization of packaging courses and select participants not through ministries but directly in the appropriate institutes, laboratories and factories.

2. Training of high level specialists

PRDC should organize short courses only for few days to train high level specialists. Subjects for such courses should comprise: necessity of carrying out tests of packages and packaging materials, economic problems, influence of packaging

costs on economics of packaging production, information activities, importance of standardization.
It should be general training about general problems in packaging for management of institutions involved in packaging.

3. Training for the developing countries

Fellowships implemented within the Project should help through upgrading qualifications of people, and improving language abilities to organize training for the developing countries. However, it should be considered that such a training should not only concern novelties in packaging but the basic packaging problems. Before this training starts it is necessary for the Polish side to consider the specific problems of developing countries.

4. Cooperation with UNIDO in the field of training

Because the research and development work is well adapted there is no urgent need for further assistance on technological aspects but there is another important aspect where UNDP assistance is recommended. Thus, it is advisable to approach UNIDO for SI project including:

a/ recognition of specific problems of the developing countries,
b/ elaboration of subject proposals to meet the needs of developing countries,
c/ purchase of programmes and audiovisual aids

in order to improve the qualifications of Polish specialists who will transfer their specific knowledge according to the needs of these countries. The costs of such a project should not exceed 80,000 dollars. 1980 would be a preferable starting date for this project.

II. 11-02 Expert in environmental pollution with packaging waste - Mr. Bennie Hansen

3-11 July 1979

Recommendations

1. The planned increase in quantities of consumer packages can be facilitated by expanding at the same time the recycling of materials and associated energy.

2. Next follow requirements for increased recycling rates of consumption waste. It is presumed that production waste recycling will be carried out to its optimal extent.
   Consumption waste can be separated and recovered through two different routes:
   - recovery through source separation,
   - recovery through mixed household waste separation.

3. It is recommended that feasibility studies will be initiated in some of the most urgent cases in the major cities of Poland.

4. At the stage of designing packaging constructions new aspects of environmental protection and possibility of energy and materials recovery should be considered.

5. In Poland, immediate attention should be given to recycling aspects of two common types of packages - one-way glass containers and tin cans.
   For this purpose it is necessary:
   - to expand the existing system for handling of returnable bottles to handle also certain types of non-returnable packages for recycling in glass factories,

- to investigate a possibility of detinning of tin cans. Up to the present tin cans are already collected and remelted but without recovery of tin.

6. It is recommended to elaborate the training programme on recycling problems.

III. 11-04 - Expert for training of packaging specialists - Dr Luis Sicre

May - June 1978

Recommendations

1. To translate into Polish in PRDC the programmes elaborated in English for organizers and participants as well as texts and books recommended by the expert, the original languages being Spanish, English and German.

2. To maintain the programmes and texts in English French and Spanish for participants coming from developing countries using these languages and to ensure lecturers with good abilities in these languages.

3. It is recommended to elaborate a list of fundamental texts in the packaging field which should be included in the library of PRDC and of the Training Centre. According to this recommendation guidelines have already been given by the expert, in order to facilitate this work, to the Polish specialists who are quite well prepared for elaborating these fundamental bibliographies.

4. In order to give to the packaging courses necessary audiovisual support it is recommended to the Training Centre to record into Polish, in a not necessarily professional way, tapes (cassette) with slide explanations and introductory and final comments for each packaging course. For other languages some audiovisual materials could be obtained from different sources, e.g. WPO, Austrian Packaging Institute, Spanish Packaging Institute, etc.

5. It is recommended that PRDC appoints a full-time person for elaborating their own audio-visual materials according to the manual containing the guidelines for such work.

6. The audiovisual equipment has to be simple with possibility for being used in different applications.

7. In the case of training specialists from the developing countries on residential courses special attention should be paid to: religious rules, regional habits, specific food, climatic conditions and appropriate entertainments.

8. Participants are to be recruited from the agricultural enterprises and factories through direct invitations according to the main activities of PRDC and the Demonstration Plant. For attending the courses a previous selection of participants should be done.

9. It is recommended that the Training Centre issues a certificate of participation to the participants in case they pass examinations.

10. It is suggested that the Training Centre organizes a permament audiovisual exhibition which is to be updated every three months.

11. In between the programmes it is suggested to organize seminars about specific matters and round-tables as a way of consulting activities.

12. The requirements for lecturers in case of training specialists from the developing countries are not different to the requirements needed for lecturers in developed countries. It is that they need to be very world-widely updated in packaging technology, able to manage a group of adults, with didactic capacity and facility for making people interested in subjects concerning the course. Especially as

far as lecturers for training participants from the developing countries are concerned the good knowledge of the foreign language is absolutely necessary.

13. In order to follow up the activity of the Training Centre it is recommended to establish bilateral agreements between Poland - PRDC and other countries packaging institutes and centres which have developed important activities in education as well as with international organizations.

14. The organization of symposia with foreign manufacturers of packaging materials and manufacturers of machinery is considered of the highest practical interest and attendance in these events has been proved as a very efficient way for receiving updated technologies.

15. In order to cover the necessity of the participants in the packaging courses, as far as modern technology, rules, standards, documentation etc. are concerned, the expert recommends to establish a new department in the PRDC under the title "Publications Department".

16. The following publications are recommended:

a/ a packaging magazine covering 3 areas of the activities in this field-

- news and novelties,
- technical information and scientific articles,
- documentation.

b/ a monthly bulletin for the urgent news which cannot wait till the issue of the magazine and abstracts based on industrial literature and informative abstracts from new developments in packaging and printing.

17. Considering that International Packaging Exhibitions are "open books" for the better knowledge of the modern packaging techniques, on materials manufacturers, machinery for producing packages and for packing all kinds of goods, methods, systems and trends it is recommended a good permament link and cooperation between PRDC and TAROPAK - the International Packaging Exhibition in Poznań and participation in other international packaging exhibitions abroad.

18. In order to increase international contacts for the Training Centre it is recommended to create in PRDC a Foreign Department which will care about international connections, recruitment of participants for courses, interchange of technology ( which is basic for the Centre ) and to achieve direct personal information by visiting countries and receiving foreign representatives of packaging industry.

IV. 11-05 Expert in packaging for fish and fish products

Mr. Horst J.Wolfrum

November 1979

## Recommendations

### 1. Metal packages

1.1. In connection with corrosion problems of external surface of tinplates during sterilization process it is recommended to make tests with treatment of cans with special protection inhibitors.

1.2. The future development of metal packages in the fish industry should consider the actual trend on the world market concerning development and introduction of seamless tinplates with easy-open closures which will be the key-project in this connection.

### 2. Glass packages

2.1. The cooperation between manufacturers of jars and manufacturers of closures as well as the fish industry should be improved to eliminate difficulties such as failures in closing jars during converting on packaging lines.

2.2. Work should be accelerated to introduce special jars for fish products with respect to certain properties such as:

- reduced weight by reduced wall thickness,
- shapes and closures according to international standards with respect to sizes and dimensional parameters.

## 3. Non-metal packages

3.1. It is recommended to elaborate a programme to prepare the introduction of:

- plastic containers,
- flexible plastic packaging materials,
- multilayers for vacuum packaging,
- multilayers in form of pouches, bags etc.

for packing fish and fish products on semi-automatically and automatically operating filling machines.

3.2. Application of a non-metal package for sour fish preserves made of fried or steamed fish pasteurized or sterilized. For this kind of fish preserves it is recommended to use glass packages in a form of transparent white jars with approx. 200-250 g capacity, twist-off or crown closures.

3.3. It is recommended to work with the general principles of selection of packaging

materials and packages in all laboratory work using the "Methods of selection of packaging materials" taking into account the present and future possibilities of supply of basic or semifinished materials of Polish origin.

## 4. Recommendations for testing materials

Following methods should be implemented insofar as they are not yet part of standard testing in the laboratory:

- checking of chemical resistance of lacquered coatings on model solutions,
- checking the porosity of lacquered coatings with application of chemical methods,
- storing preserves in planned guarantee period,
- carrying out periodical assessments of package and product,
- carrying out analytical work concerning changes of product during the storage period.

V. 11-06 Expert in production and application of packages made of treated board.

Dr Longin Placzek

June 1980

## Recommendations

1. In the nearest future a bigger demand for machines for paper and board coating is planned - such type of equipment should be based on plastic materials - PE and PVDC. For this purpose it is recommended to apply extruders together with coating facilities. An extruder and equipment for coating should be adapted to work in one line or separately if such a need arises.
   Equipment for coating should have 2 heads for coating with PVDC emulsions and a drying tunnel.

2. For such specific packages as peel and blister packages it is recommended to use coated paper or cellophane with hot-melts. They are usually used for packing snack, cereals and gels.

3. It is recommended to purchase machines for coating with hot-melts and waxes but also with possibility of laminating.

4. An alternative solution could be metallizing. It is used in order to save material and to decrease costs of production of wrappings with low light transmission.
The technology of metallizing films and papers is based on evaporation of aluminium under vacuum on one machine and lacquering or laminating on the second one.

5. Taking into account world developments in the field of coating and lacquering it is recommended to purchase a pilot machine that will be used for introducing new techniques on a small scale.
Assuming that it will be a combination of printing, coating and laminating the pilot equipment should cover 3 different operations in one line.

6. Recommendations concerning training activities

They could be presented in few words: new technologies such as metallizing and application of solvent free adhesives require a special training. Such training can be organized successively for producers of materials and equipment.
It is recommended to train at first staff employed in the manufacture of papers and films for converting on new machines.

## 7. Recommendations concerning paper materials used in the packaging industry

There exists an urgent need for the improvement of paper and board quality. It concerns first of all paper for printing and siliconizing for corrugated and solid fibreboard.

Better properties of these materials could contribute to the decrease of import of coated materials and to lead to the improvement of the quality of final products.

INDIVIDUAL FELLOWSHIPS ANNEX 7

| UNIDO No. | Project No. | Fellowship post | Fellowship's name | Country of study | Fixed date | Remarks |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| | | Packaging Research and Development Centre in Warsaw | | | | |
| 31-13 | 31-01 | Methods for testing migration of packages and packaging material components to packed foodstuffs. | W.Sarzyński | Austria Sweden | 9.X-30.XI 1979 | |
| 31-14 | 31-02 | Methods for utilization packaging waste from the viewpoint of environmental protection. | W.Strus | Switzerland | 18.X-15.XI 1979 | Subject changed |
| 31-28 | 31-03 | Manufacture, processing and application of treated packaging materials based on laminates. | B.Czerniawski | FRG Switzerland Netherlands | XI 1980 | Subject changed |
| 31-15 | 31-04 | Designing of techniques for packed foodstuffs into consumer packages with particular consideration of the extension of product shelf-life. | S.Kierkus | FRG Sweden Denmark | III-IV 1979 | |
| 31-06 | 31-06 | Designing of unit loads taking into account modern transport and storage methods. | J.Remin | Switzerland FRG | 26. VII-7.X 1978 | |
| 31-04 | 31-05 | Designing of transport packages and packaging processes. | M.Kasprzyk | France | 5.XI-30.XI 1979 | |
| 31-23 | 31-07 | Organization and principles of rational handling of returnable packages. | K.Albigowska | Sweden Austria Denmark | 6.VI-20.VII 1979 | |
| 31-08 | 31-08 | Organization and economic efficiency of packaging waste recycling and rational methods for their annihilation in view of forecasts of packaging industry development and environmental protection against pollution by packaging waste. | S.Szczepański | Sweden FRG Austria | 16.VIII-18.X 1978 | |
| 31-16 | 31-09 | Methods for anti-corrosion packing of metal products. | J.Zawadzka | FRG Austria | 16.III-6.V 1978 | |
| 31-01 | 31-10 | Modernisation of methods for the preparation of scientific, technical and economic information in packaging. | J.Zembrzuski | Great Britain | 26.I-11.III 1978 | |

| UNIDO No | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 31-27 | 31-11 | Modern technological and organizational solutions applied in production of paper packages in printing industry. | H.Kubera | Austria | VI-VII 1979 | Subject changed |
| 31-24 | 31-12 | Standardization of technical parameters for consumer, multiple and transit packages. | Z.Mazur | FRG Austria | 7.X-15.XI 1979 | |
| 31-20 | 31-13 | Application of modified and treated packaging materials based on plastics. | W.Małaśnicka | FRG | 7.V-11.VI 1979 | |
| 31-02 | 31-14 | Testing and evaluation of changes in packaging materials utility value and evaluation of their quality changes in the process. | G.Nastorowicz | Sweden | 29.IX-15.XII 1978 | |
| | | Demonstration Plant in Białystok | | | | |
| 31-09 | 31-15 | Extrusion and modification of coating and treatment of PP,PA and Polyester films applied for laminating. | B.Ruta | FRG Switzerland | 6.X-6.XII 1978 | |
| 31-05 | 31-16 | Production technology of multilayer films for packing meat, meat products, cheeses by solvent lamination,coextrusion,coating and lacquering. | M.Gryżewski | FRG Great Britain | 21.IX-15.XI 1978 | |
| 31-17 | 31-17 | Testing methods for multi-layer films. Technological and laboratory selection of films under consideration of their compatibility with products and packing. | M.Kopycińska | FRG Great Britain | 7.V-11.VI 1979 | |
| - | 31-18 | Cancelled | - | - | - | |
| | | Central Laboratory of Fishing Industry in Gdynia | | | | |
| 31-10 | 31-19 | Packages made of plastic,paperboard and fibreboard for fish and fish processing products. | G.Orwat | Finland Great Britain | 16.X-2.XI 1978 | |
| - | 31-20 | Technological and technical conditions for the production of fish preserves packed in flexible and glass packages. | B.Markowski | FRG France | | Under implementation |
| | | Pulp and Paper Research Institute in Łódź | | | | |
| 31-29 | 31-21 | Production techniques for paper and paperboard coated with hotmelts applied for manufacture of consumer and transit packages for foodstuffs. | T.Graczyk | Sweden Finland | 29.IX-8.XI 1980 | |

| UNIDO No. | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 31-21 | 31-22 | Production technology for consumer packages for foodstuffs as well as consumer and transit packages for metal products considering anti-corrosion problems.<br><br>UN-UNDP Packaging Research Development Programme Bureau in Warsaw | A.Bednarek | Sweden FRG Finland | 6.V-9.VI 1979 | |
| 31-22 | 31-23 | Methods and organization of training in packaging field. | K.Kleszczewska | Austria | 7.VIII-7.IX 1979 | |
| 31-18<br>31-19 | 31-24 | Getting acquainted with the principles of installation, erection, construction and with the principles of maintenance and technical service of laboratory laminating machine.<br><br>Plastic Fibres Factory Chemitex-Wistom Tomaszów Mazowiecki | J.Jośdicki<br>A.Kuzia | Great Britain | 1.III-21.III 1979 | |
| 31-25 | 31-25 | Manufacture and conversion of cellophane.<br><br>Plastics Factory "Nitron R" Krupski Młyn | M.Pijaroczyk | Austria France | 1.X-1.XI 1979 | New subject for the representative of industry |
| 31-11 | 31-26 | Production of modified packaging materials for the food industry. | S.Matyaszczyk | FRG | IX-X 1978 | New subject for the representative of industry |

ANNEX 8

GROUP TRAINING

| Project No | Fellowships post | Fellowship's name | Country | Fixed date |
|---|---|---|---|---|
| 32-01 | Principles of construction, manufacture and use of flexible containers. | S.Jakowski PRDC-Warsaw<br>T.Pułczyński PRDC-Warsaw<br>W.Mokrzycki Institute of Building Mechanization<br>A.Łapiński Institute of Building, Mechanization and Electrification of Agriculture<br>H.Nowodziński Technical Clothing Manufacture Factory "POLNAM" | Austria<br>FRG<br>France | 9.X-29.X 1977 |
| 32-02 | Organization of designing enterprises engaged in constructional design of packages and packing techniques. | St.Krogulski PRDC-Warsaw<br>P.Kłosiewicz DP in Konstancin<br>E. Bielski Branch Office of PRDC in Bytom<br>H.Norwisz Branch Office of PRDC in Bytom<br>M.Feldman PRDC-Warsaw | Finland<br>Sweden<br>Denmark<br>France | 19.XI-9.XII 1978 |
| 32-03 | Organization and management of research institutions and enterprises which manufacture packaging materials and packages. | J.Lekszycki PRDC-Warsaw<br>S.Nowacki DP-Białystok<br>Wł.Barcicki DP-Białystok | FRG<br>Austria<br>Italy | X 1979 |

ANNEX 9

# A LIST OF NON-EXPENDABLE EQUIPMENT PROVIDED BY UNIDO

| Project No. | Equipment | Price in US $ | Year of delivery | Remarks |
|---|---|---|---|---|
| | **Packaging Research and Development Centre in Warsaw** | | | |
| I/1 | Laboratory laminating machine | 89 918 | 1979 | |
| I/2 | Additional table for compression tester of the Lorentzen | 3 655 | 1978 | |
| I/3 | 16 mm projector screen for day-light | 1 920 | 1979 | |
| | Additional equipment according to Project Revision: | | | |
| | a/ Overhead Projector | 500 | 1980 | |
| | b/ Kodak Carousel SRA 2000 Projector | 2 086 | 1981 | Ordered. Delivery time - February 1981 |
| | c/ Exposure meter-Minolta Auto-Meter II | 166 | 1980 | |
| | d/ Simultaneous Interpretation Transmission System | 19 225 | 1981 | Ordered. Delivery time - March 1981 Higher price possible because of additional cables and insurance. |
| | **Demonstration Plant in Białystok** | | | |
| II/1 | Equipment for permanent measuring of tape thickness | - | - | Cancelled because of the possibility of purchasing equipment from other sources. |
| II/2 | Equipment for spot measuring of film thickness | 2 185 | 1979 | |
| II/3 | Climatic chamber | - | - | Cancelled because of costs. |
| | Slip testing table | 385 | 1978 | |
| II/4 | Electrometer | 2 620 | 1978 | Price higher about 1005US $ because of purchasing additional probe to have multi-purpose electrometer |
| II/5 | Oscilloscope with memory | 2 430 | 1978 | |

| | Equipment | Price in US $ | Year of delivery | Remarks |
|---|---|---|---|---|
| II/6 | Oxtran- apparatus for testing oxygen permeability through flexible materials | 11 965 | 1978 | Price higher 7 165 US $ because of purchasing more precise and multi-purpose electrometer. |
| II/7 | Laboratory heat sealer type Kopp | 6 070 | 1978 | Price higher 2 470 because of better, modern construction. |
| II/8 | Tachistoscope | - | - | Cancelled. |
| II/9 | Set of spare parts for the equipment purchased for PRDC in Warsaw and DP in Białystok. | 3 406 | 1979<br>1980 | |
| | <u>Central Laboratory of Fishing Industry in Gdynia</u> | | | |
| III/1 | Apparatus for the measurement of vacuum pressure in plastic packages | - | - | Cancelled-because of difficulty in finding producer. |
| III/2 | Set for testing and measurement of end (double seam in metal cans) | 2 760 | 1980 | |
| III/3 | Climatic chamber | - | - | Cancelled-because of necessity of covering higher costs of other equipment (mainly Laminating machine). |
| | <u>Pulp and Paper Research Institute in Łódź</u> | | | |
| IV/1 | Slotting machine for corrugated fibreboard | 34 642 | 1980 | |
| IV/2 | Heating pistol for shrink film wrapping of palletized loads | 760 | 1979 | |
| | Spare parts for equipment delivered by UNIDO | 2 345 | 1981 | |
| | T o t a l | 187 038 | | |

ANNEX 10

A LIST OF MORE IMPORTANT SEMINARS ARRANGED DURING PROJECT IMPLEMENTATION WITH THE ASSISTANCE OF FOREIGN EXPERTS

i/ Seminars directly connected with the Project

| No | Subject | Place and date | Expert's name |
|---|---|---|---|
| 1. | Training for people dealing with packaging problems. | Warsaw 6.06.1978 | Luis Sicre-expert in organization of training for packaging specialists. UNIDO |
| 2. | Recycling of packaging waste. | Warsaw 7.07.1979 | Bennie Hansen-expert in environmental protection. UNIDO |
| 3. | World's trends towards application of plastic packages. | Warsaw 13.12.1979 | Horst Wolfrum-expert consultant. UNIDO |

ii/ International Symposium JAPRI (International Association of Packaging Research Institutes)
This Symposium was held in Packaging Research and Development Centre in Warsaw from 22 till 24 May 1980 with the participation of about 40 specialists in packaging problems from Advanced West and East European Countries and the United States. The subject of the Symposium was complicated, it included research, economic and technological problems of the transport packages for export as well as material and energy absorptiveness testing, techniques of packing and also progress in testing methods and equipment.

ANNEX 11

PACKAGING COURSES ARRANGED BY THE TRAINING CENTRE IN BIAŁYSTOK

| No | Co-organizer | 1978 | | | 1979 | | | 1980 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Number of courses | Number of days | Number of participants | | | | | | |
| | | a | b | c | a | b | c | a | b | c |
| 1. | Central Standardization Inspectorate | 2 | 2x4 | 79 | 1 | 3 | 34 | - | - | - |
| 2. | The Main Union for Research Works of Plastic Packages | 1 | 12 | 28 | 2 | 5<br>6 | 23<br>28 | 1<br>1 | 19<br>19 | 38<br>38 |
| 3. | Ministry of Chemical Industry | 1 | 12 | 53 | 1 | 4 | 26 | - | - | - |
| 4. | The Central Union of Consumer Cooperatives (Społem) | 2 | 2x11 | 63 | - | - | - | - | - | - |
| 5. | Research and Constructional Centre of Machine Tools in Pruszków | - | - | - | 1 | 6 | 25 | 1 | 6 | 15 |
| 6. | Ministry for the Materials Economy | - | - | - | - | - | - | 1 | 6 | 34 |
| | Total | 6 | 54 | 223 | 5 | 24 | 136 | 4 | 50 | 125 |

ANNEX 12

A. UNDP CONTRIBUTION IN US DOLLARS

| Project No. | Item | Total | 1977 | 1978 | 1979 | 1980 | 1981 |
|---|---|---|---|---|---|---|---|
| 11 | Experts | 32,517 | 796 | 13,552 | 7,897 | 9,120 | 1,152 |
| 30 | Training | | | | | | |
| 31 | Fellowships | 64,141 | | 19,652 | 30,561 | 8,129 | 5,799 |
| 32 | Study-tours | 24,575 | 7,624 | 11,367 | 5,273 | 311 | |
| 39 | Training total | 88,716 | 7,624 | 31,019 | 35,834 | 8,440 | 5,799 |
| 49 | Equipment | 187,038 | | 47,739 | 79,846 | 57,108 | 2,345 |
| 52 | Sundries | 2,716 | | 1,181 | 592 | 943 | |
| 53 | Reports | 1,800 | | | | | 1,800 |
| 59 | Miscellaneous | 4,516 | | 1,181 | 592 | 943 | 1,800 |
| 99 | GRAND TOTAL | 312,787 | 8,420 | 93,491 | 124,169 | 75,611 | 11,096 |

B. CONTRIBUTION OF THE GOVERNMENT OF POLAND IN ZLOTYS

| Project No. | Item | Total | 1977 | 1978 | 1979 | 1980 | 1981 (3m) |
|---|---|---|---|---|---|---|---|
| 10 | Personnel | | | | | | |
| 01<br>02 | Director<br>Staff | 1,332,127 | 75,400 | 270,600 | 417,991 | 443,136 | 125,000 |
| 19 | Personnel total | 1,332,127 | 75,400 | 270,600 | 417,991 | 443,136 | 125,000 |
| 30 | Training | | | | | | |
| 31-01 | Language course | 50,000 | | 50,000 | | | |
| 31-02 | Training Centre | 4,464,666 | | 1,326,000 | 1,374,666 | 1,414,000 | 350,000 |
| 39 | Training Total | 4,514,666 | | 1,376,000 | 1,374,666 | 1,414,000 | 350,000 |
| 40 | Investments | | | | | | |
| 41-01 | Equipment | 185,056,000 | | 8,309,000 | 30,161,000 | 146,586,000 | |
| 41-02 | Buildings | 121,661,000 | | 21,347,000 | 59,314,000 | 41,000,000 | |
| 41-03 | Other inputs | 221,843,562 | | 33,655,000 | 15,518,062 | 172,670,500 | |
| 49 | Investment tot. | 528,560,562 | | 63,311,000 | 104,993,062 | 360,256,500 | |
| 99 | GRAND TOTAL | 534,407,355 | 75,400 | 64,957,600 | 106,785,719 | 362,113,636 | 475,000 |