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ESTABLISHMENT OF A PACKAGING UNIT AT INSTITUTE FOR RESEARCH AND  
DEVELOPMENT OF CHEMICAL INDUSTRY (BBIK)

DP/INS/86/005

INDONESIA

Terminal report\*

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

Based on the work of Kurt H. Garmin, senior consultant on packaging

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Vienna

\* This document has not been edited.

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## EXPLANATION OF ABEREVIATIONS

AFKI	=	ASSOCIATION OF INDONESIAN FLEXIBLE PACKAGING INDUSTRIES
AKKI	=	ASSOCIATION OF INDONESIAN CAN PACKAGING INDUSTRIES
APIGI	=	ASSOCIATION OF INDONESIAN GLASS MANUFACTURER
APIKI	=	ASSOCIATION OF INDONESIAN PULP & PAPER INDUSTRY
BAPPENAS	=	NATIONAL DEVELOPMENT PLANNING AGENCY
BBIHIP	=	INSTITUTE FOR R & D OF AGROBASED INDUSTRIES
BBIK	=	INSTITUTE FOR R & D OF CHEMICAL INDUSTRY
BBIT	=	INSTITUTE FOR R & D OF TEXTILE INDUSTRY
BBK	=	INSTITUTE FOR R & D OF CERAMIC INDUSTRY
BHS	=	INSTITUTE FOR R & D OF CELLULOSE INDUSTRY
BAT	=	INSTITUTE FOR R & D OF MATERIAL & TECHNICAL GOODS
BPTI	=	AGENCY FOR INDUSTRIAL RESEARCH & DEVELOPMENT
DITJEN AI	=	DIRECTORATE GENERAL MULTIPARIOUS INDUSTRY
EEC	=	EUROPEAN ECONOMIC COMMUNITY
FIPPLASIN	=	FEDERATION OF INDONESIAN PLASTIC INDUSTRY
FPI	=	INDONESIAN PACKAGING FEDERATION
IPI	=	INDONESIAN PACKAGING INSTITUTE
IPT	=	INSTITUTO DE PRSQUISAS TECNOLGICAS DO ESTADO DE SAO PAULO
ITAL/CETEA	=	INSTITUTO DE TECNOLOGIA DE ALIMENTOS CENTRA DE TECNOLOGIA DE EMBALAGEM DE ALIMENTOS
ITC	=	INTERNATIONAL TRADE CENTRE UNCTAD/GATT
PICCI	=	ASSOCIATION OF INDONESIAN CORRUGATED/CARDBOARD INDUSTRIES
PIMB	=	CENTRE FOR TESTING AND QUALITY CONTROL
REPELITA IV	=	INDONESIAN FOURTH NATIONAL DEVELOPMENT PLAN 1985 - 1989
REPELITA V	=	INDONESIAN FIFTH NATIONAL DEVELOPMENT PLAN 1990 - 1994

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## ABSTRACT

The implementation activities of the project DP/INS/86/005 "Establishment of a Packaging Unit at Institute for Research and Development of Chemical Industry (BBIK)" started on 21 December 1987 when the Senior Consultant for Packaging took up his assignment in Jakarta and ended on 26 September 1989. The direct contributions to the project according to the latest budget revisions, was USD 403,404 from the United Nations Development Programme and Rp.59,751,297 from the Government of Indonesia. In addition existing equipment and building facilities were allocated for the Unit.

In spite of considerable delays in some equipment deliveries and difficulties in arrangement of overseas training programmes the project was completed within the overall time table scheduled in the Project Document.

A basic testing facility for packaging materials, for primary packaging for food and for transport packaging has been established together with an information and documentation support unit.

A strong effort is required in order to upgrade the staff's knowledge about industrial aspects of packaging, and adapt the unit to solve practical problems using the new equipment and training inputs.

It is recommended that a follow-up project should be prepared with the purpose of upgrading the technical facilities to make the packaging unit able to cover a large range of testing methods for fibreboard and plastic materials for packaging, to be able to test pack in wider ranges of primary packages and to carry out testing according to international recommendations for testing transport packaging for dangerous commodities and perishable produce.

## INTRODUCTION

### A. Project Background

The industrial sector in Indonesia is rapidly developing and diversifying itself into a wide range of productions, including higher added value production. The exports, similarly, are expanding, especially the exports of non-oil products, now constituting per cent of the exports. These developments also include the agro based industries and the exports of agro based products.

This development requires increased quantities of packaging, and more protective, more promotional types of packages, and also a wider range of packaging with more specific properties.

Many agricultural products undergo a degradation in their nutritional value due to damages suffered during storage, handling and transportation which could be avoided through the use of appropriate packaging materials and techniques. The industrial products as well suffer losses and damages in the distribution system. Adequate protection and rationalization through well developed packaging can effectively reduce losses and damages as well as contribute to a thorough rationalization of the transportation and distribution of industrial products.

In order for Indonesian products to effectively meet the competition from imported products in the domestic market, it is necessary that they adopt properly designed and economically viable packaging materials and methods.

The standards of packaging in the Indonesian industries must also necessarily reach the levels where products and commodities of Indonesian origin can also effectively compete in the export markets against the packaged products of their competitors. This calls for upgradation of the packaging methods and materials used.

At the national level, there is a need to attempt planned growth of the packaging industry. In this connection, an overall knowledge of the country's requirements of specific packaging materials would constitute a solid basis for related actions by both the Government and the packaging industry.

The enlargement of small industry and improvement of their



productivity is a major aim of REPELITA V as it was of REPELITA IV. In this context, the improvement, inter alia, of quality and packaging have been identified as major requirements for the small scale food and beverage sector. Improved packaging can also be considered to be a major factor in improving the viability of the small enterprise by extending the shelf-life of products and offering concomitant marketing advantage, particularly market outreach and increased leverage in pricing.

Prior to the establishment of the project a sample survey was carried out for small scale food industries in Indonesia. According to this inadequate and inappropriate packaging results in the small sector food products industries because of:

- a) inability to select proper packaging material.
- b) poor and inappropriate design of package
- c) poor sealing methods.

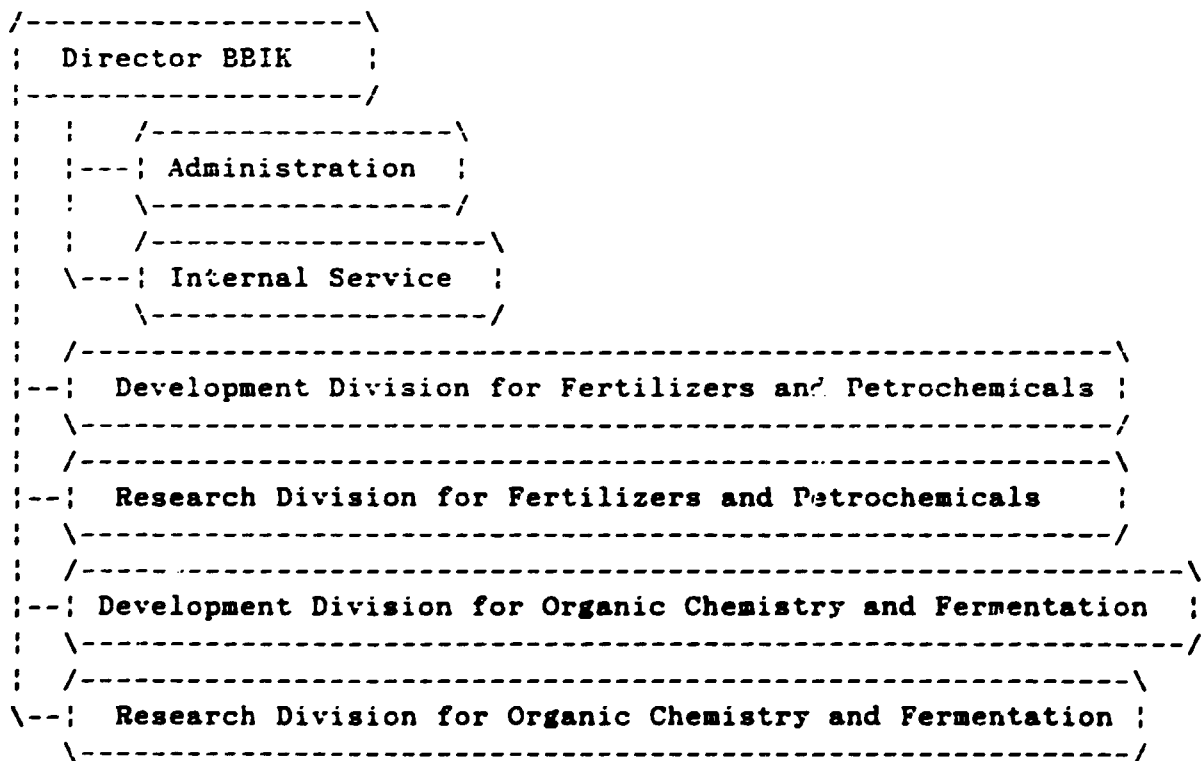
The small food products industry mainly package their products using plastic materials; to a much smaller extent, paper cartons are also used.

B. Organization background

BBIK

Balai Besar Industri Kimia (Institute for Research and Development in Chemical Industry) or BBIK is a Government institution referring to the Department of Industry, Agency for Industrial Research and Development (BPPI). BBIK is acting as adviser to the Department with respect to the development of the Indonesian chemical industry, including formulation of standards related to this industry, providing technical documentation and advisory services to the relevant industries, and performing laboratory testing associated with certification schemes, as part of general development activities, and on an exclusive basis for individual industries and trades.

BBIK is headed by the Director BBIK. The external service work is organized in four executing divisions, assisted by internal service functions, including a workshop and a library:



The Development Division for Fertilizers and Petrochemicals is subdivided into four sections:

- Economic Section;
- Development Technology Section;
- Experimental Section and
- Section for Normalization and Standardization.

Laboratory work is carried out by the various sections, each within certain technical-scientific fields. All four sections are engaged in the packaging work as kind of side activities under the joint name of packaging unit.

The Research Division for Fertilizers and Petrochemicals is subdivided into:

- Pesticides Section, performing laboratory analysis and research. This section is a member of international and regional co-operation arrangements; and
- Pollution Section, working with water and air pollution, including heavy metals pollution. This laboratory has modern analytical equipment, such as for liquid chromatography, gas chromatography and atomic absorption spectrophotometry.

The Development Division for Organic Chemistry and Fermentation works in two fields:

- Food and beverages in which field the division develops draft SII Standards, and carries out the control analyses, mainly chemical, required in the certification schemes associated with some of the standards.
- Cosmetics which is a new activity and where the work is mainly of a research nature. The purpose of the activity as well is development of standards and establishment of certificate schemes.

The Research Division for Organic Chemistry and Fermentation mainly works on search for productions to substitute for small scale manufacturer. The dye stuffs, sea weed products, biogas production for cooking, cashew nut oil, citric acid and treatment of waste from the organic chemical and fermentation industries.

A restructuring of the organization is at present under consideration.

The packaging testing activities of BBIK are carried out by three laboratories:

- laboratory for testing packaging materials,
- laboratory for testing of primary food packaging, and
- laboratory for testing transport packaging.

The managers of the three laboratories and the packaging library, who are simultaneously managers of the Economic Section, the Section for Normalization and Standardization, the Section for Experiments and the Development Technology Section refer each directly to the Head of the Development Division for Fertilizers and Petrochemicals. No management structure has been assigned with the sole task of operating and co-ordinating the BBIK packaging activities on a full time basis.

Approximately 20 BBIK staff members have been part-time assigned to the packaging activities, of which 9 graduates and 14 undergraduates.

The graduates hold university level degrees in chemical engineering, agricultural technology, pharmacy and chemistry. The undergraduates have a training background in technical schools (bachelors) and from practice in BBIK. An organigramme for the packaging unit is reproduced in Annex I.

#### Other packaging institutions

Due to the nature of packaging a range of other Indonesian Government laboratories carry out testing activities related to packaging. The majority of these laboratories are referring to the Department of Industry, including:

- Balai Besar Industri Bahan dan Barang Teknik (B4T), Bandung
- Balai Besar Industri Keramik (BEK), Bandung
- Balai Besar Industri Tekstil (BBIT), Bandung
- Balai Besar Industri Selulosa (BES), Bandung, and
- Balai Besar Industri Hasil Pertanian (BBIHP), Bogor.

Various institutional activities within the field of packaging are carried out, or under establishment, also outside the regime of the Department of Industry, especially by the private institution the Indonesian Packaging Institute and by the packaging laboratory of the Pusat Pengujian Mutu Barang (PPMB) under the Department of Trade.

Indonesian Packaging Institute (IPI) is closely related to the Indonesian Packaging Federation, the umbrella organization for the Indonesian packaging manufacturing industries' branches. IPI carries out consultancy and information activities. Although private, and 100 per cent privately financed, IPI refers to the Department of Industry, Directorate General for Small Scale Industry. However, the non-Government status of IPI enables it to employ staff members on conditions independent of the strict Government salary regulations. IPI, thus, is able to attract staff members with industry experience.

IPI publishes the only Indonesian packaging periodical "Infopack".

IPI's activities were established with the assistance of consultancies and training provided by the European Economic Community.

Pusat Pengujian Mutu Barang (PPMB) is situated 3 km from BBIK. It has been established to carry out certification testing of various products, especially export products. For testing of packaging a range of equipment has been provided through various bi-lateral assistance programmes, and overseas training of the staff has been carried out. A 3 year USD 1.4 million programme is now under preparation in order to make the packaging activity operative. This programme is financed by the Government of the Netherlands.

The packaging testing equipment provided for PPMB is extensively a duplication of the equipment installed at BBIK.

#### Co-ordination of the institutional activities

The expected industrial development in Indonesia towards higher added value productions will require packaging related support activities of a nature complementary to the activities now established at BBIK. Much of this needs a technical background within specialized areas which are deeper than can be established within a general packaging laboratory.

However, in order to prevent duplication of expertise and equipment, to secure the optimum synergistic effect, and to prevent negative effects of conflicts of interest good co-ordination and co-operation is required.

A co-ordination of the activities of BBIK and IPI was established through a mutual adaptation of the assistance programmes for the present UNDP/UNIDO project and the EEC funded project NTP/84/700/927; Technical Assistance to the Indonesian Packaging Institute by the SIDFA and the EEC project co-ordinator. Through this co-ordination a triplication of laboratory testing facilities was prevented. The co-ordination of the two projects also resulted in introduction of the IPI consultants to the BBIK laboratory work and assistance by IPI in translation of the majority of the materials testing procedures to Indonesian. Moreover, IPI has assisted in the establishment of the BBIK packaging library by making a large number of its documents available to BBIK for copying.

Besides this, little co-ordination efforts have been made, and co-operation between institutions have been sporadic and unsystematic. No joint development projects have been reported.

Formal liaison between the packaging related institutions of the Department of Industry, the Department itself, the Indonesian Packaging Federation and its branch organizations, and the Indonesia Packaging Institute has been established through the Packaging Forum (formed in mid-1986) which is composed of

<u>Name</u>	<u>Associated with</u>	<u>Appointed by</u>
Ir. J.F. Wattimena (Chairman)	DITJEN AI	Dept. of Industry
Drs. Sudarmadji (Chairman I)	BPPI	Dept. of Industry
Ir. J. Kusnadi (Chairman II)	BBIK	Dept. of Industry
Ir. Harris Sutakaria (Chairman III)	IPI	IPI

<u>Name</u>	<u>Associated with</u>	<u>Appointed by</u>
Drs. Triyanto Hs. MSc. (Secretary)	BBIK	Dept. of Industry
Drs. Syahida Samik (Secretary I)	BPPI	Dept. of Industry
Ir. Samiha Syamsudin (Secretary II)	BBIK	Dept. of Industry
J. Santo. Dipl. Chem.	FIPLASIN	FPI
Drs. Machzum Emman	PT PUSRI	Dept. of Industry
Ir. Atih Suryati MSc	BBIHP	Dept. of Industry
Ir. Robiatun	BBIK	Dept. of Industry
Ir. Imam Waluyo	BBS	Dept. of Industry
Ing Patinama	DITJEN AI	Dept. of Industry
Bambang Suyono	APPKI	FPI
Ir. Sumadi	PICCI	FPI
Dra. Liles Suryati	BBIK	Dept. of Industry
Ir. Robert Siagian	DITJEN AI	Dept. of Industry
Drs. Soedjono P. Soetono BSc	APGI	FPI
Ir. Suyoto	DITJEN AI	Dept. of Industry
Ir. Liliek Suparmi	BEK	Dept. of Industry
Ir. Farhan Syahdi	BBIK	Dept. of Industry
Ir. Rochati D. Soemadji	PT LATINUSA	PT LATINUSA/Private
J.R. Sularto	B4T	Dept. of Industry
Ir. Sulaiman	DITJEN AI	Dept. of Industry
	PT UNITED CAN	A.K.K.I/FPI
	BBIK	Dept. of Industry

The Packaging Forum assembles irregularly. The intervals between meetings have tended to increase over the last year:

1986: 2 meetings  
 1987: 5 meetings  
 1988: 4 meetings  
 1989: 0 meetings

The Packaging Forum has been mainly a meeting place where experts have lectured on various technical aspects of packaging. The Packaging Forum has not developed into an instrument for systematic planning.

co-ordination and co-operation within the packaging institutional activities in Indonesia.

Based on a study made by Mr. J.F. Victor, Centre Inter Laboratoires d'Etudes et de Realisations, a proposal on establishment of an advisory board for co-ordination of the packaging institutional activities of the Department of Trade (PPMB), the Indonesian Packaging Federation (Indonesian Packaging Institute) and the Department of Industry (BBIK) has been brought forward.

A study of the structure of the packaging industry in Indonesia, financed by a loan from the World Bank is under preparation. It is expected that the report of this study will be ready by mid-1990. The terms of reference for this study also includes recommendations for institutional support. The project is carried out with reference to the Department of Industry, Directorate General for Multifarious Industries. The provisional budget for the study is around USD 0.5 million .



## I. OBJECTIVES AND LOGIC OF THE PROJECT

### A. Development objective

The development objective of the project was the improvement of the packaging of Indonesian products in order to enhance their competitiveness in domestic and export markets.

### B. Immediate objectives

The immediate objectives of the project was the establishment of a packaging unit within the Balai Besar Penelitian dan Pengembangan Industri Kimia, BBIK (Institute for Research and Development of Chemical Industry) to provide testing and advisory services to packaging materials producers, converters and users of packages relevant to the food sector.

Five success criteria were outlined for the accomplishment of the immediate objectives:

1. An operating capability for testing of plastic and paper packaging materials;
2. An operating capability for testing of retail unit packages for packaged food products;
3. An operating capability for testing of transport packages relevant to the food industry;
4. A research and training capacity for undertaking testing and development in terms of compability and shelf life of food packages and organising seminars and training programmes for participants from the packaging materials manufacturing and converter industries; and
5. Improved and effective linkages between the packaging unit, the Indonesian Packaging Institute, the Indonesian Packaging Federation, the Institute for Agro Industries (Balai Besar Industry Hasil Pertanian) and others for promotion of the correct packaging methods.

### C. Project Logic

The logic of the project in order to reach the objectives can be summarized as follows:

1. Identification of the demand for activities of the packaging unit through contacts to industries, institutions and authorities;
2. Identification in details of service capabilities required to fulfill the demand and ordering of appropriate equipment, including documentation;
3. Identification of accommodation and installation requirements and assignment of specific BBIK areas for each purpose;
4. Identification of needs for overseas training and for in-service training by international experts;
5. Overseas training of key persons;
6. Control of equipment delivered and preparation for its installation;
7. Installation and calibration of the equipment, and in-service training in operation of the equipment and interpretation of test results by international experts. Registration and classification of documentation; and
8. Arrangement of seminars for information to the industry and other institutions about the new facilities.

### D. Project Organization

The project has been carried out under the responsibility of the Department of Industry, Agency for Industrial Research and Development (BPPI). The process of implementation has been supervised by the Director of BBIK, Mr. J. Kusnadi, acting as National Project Director. The day-to-day execution has been in the hands of the Chiefs, Development Division for Fertilizers and Petrochemicals, Mr. D.

Karyadi (until 14 August 1989) and Mr. Triyanto Hadisoemarto (from 15 August 1989).

A UNIDO Senior Consultant on Packaging was assigned with the project to advise the project management in the process of implementation. The Senior Consultant stayed in Jakarta for several periods, in total 7 months, during the 22 months of implementation (December 1987 to September 1989).

Three short-term consultants:

- on testing of packaging materials,
- on testing of primary packaging for food, and
- on testing of transport packaging

each served 2-3 months on installation and calibration of the equipment and on training of the staff in its operation, also including introduction to the testing standards in international use and interpretation of test results.

The short-term consultants each worked in close co-operation with their assigned counterparts, the managers of the three BBIK packaging laboratories.

A time-table on the management and consultancies is reproduced in Annex II.

#### E. Outline of the project as implemented

The Project Document for the project was signed on 1 July 1987 and initial actions on assignment of a Senior Packaging Consultant and ordering of non-expendable equipment were performed during the following months.

The Senior Packaging Consultant took up his first assignment in Jakarta in December 1987. During this mission (until March 1988) contacts were made to industries, institutions and authorities, a work plan for the implementation of the project was developed, the organization of the packaging unit, including full job descriptions, was established, accommodation for the unit was arranged, procurement and construction of additional non-expendable and of expendable

equipment was prepared, and overseas training programmes and job descriptions for international experts were formulated.

The National Project Director and the Chief of the BBIK Packaging Unit at that time traveled to Europe and India in September 1988 to study the organization and management of packaging laboratories.

Most of the laboratory equipment arrived during the first half of 1988 and was checked by the Senior Packaging Consultant in January-March, and during his mission in November-December 1988, except for the transport packaging testing equipment which was checked by the Expert on Testing of Transport Packaging, who took up his mission simultaneously with the second mission of the Senior Consultant.

The transport testing equipment which was designed by the Senior Consultant for construction by the BBIK work shop had not been made at the arrival of the Transport Packaging Testing Expert, due to delayed Government funding for procurement of materials, and consequently, could not be included in the transport packaging testing and staff training programme. Moreover, long installation time for the imported equipment, in combination with an abridged time of the transport packaging testing consultancy condensed the practical training in testing of transport packaging.

Due to difficulties in finding proper training facilities the overseas training programmes could not be implemented until February-March 1989, in which period all three laboratory managers were trained in USA and Brazil.

The consultancies on testing packaging materials and primary packaging for food were implemented in two parts, first part in January 1989 followed by two-months assignments in the period May-July 1989 after the return of the laboratory managers from their overseas training.

A range of testing procedures referring to the equipment installed were prepared. A major part of these were translated into Indonesian in cooperation with the Indonesian Packaging Institute.

The climatic cabinet provided for controlled storage of packed food products arrived at the termination of the consultancy on primary food packaging, too late to be used for the shelf life testing programme. Shelf life testing was carried out, therefore, using non-conditioned room and commercial refrigerator climates only.

The three experts carried out on-the-job training programmes and class-room training programmes for the staff members of BBIK and gave seminars for invited audiences from relevant industries and institutions.

A time-table on the seminars and staff training activities are reproduced in Annex III.

## II. ACTIVITIES CARRIED OUT AND OUTPUTS PROVIDED

### A. Introduction

The objectives, the contents, the organisation and the location of the project were all clearly defined prior to the implementation of the project and reflected in the Project Document. The field work, consequently was mostly of a practical nature involving recruitment of international experts, consultancies on selection of housing facilities, installation of equipment, and arrangement and execution of staff training programmes in Indonesia and abroad. The selection of the major part of the internationally financed equipment was carried out at the UNIDO Headquarters prior to the beginning of the field work on the basis of the requirements formulated in the Project Document.

During the initial phases of the implementation the needs for additional equipment were identified, technical drawings and procurement specifications were prepared and the financial background established, partly through funds made available by the Government of Indonesia and partly through additional UNDP funding. The major part of the Government financed and all non-expendable equipment financed by UNDP were delivered within the life time of the project.

A list of the major documents, including mission and training reports, produced by the project is reproduced in Annex IV.

### B. Testing laboratories

Three testing laboratories were established, as foreseen in the Project Document:

- Laboratory for testing of packaging materials;
- Laboratory for testing primary packaging for food;
- Laboratory for testing transport packaging.

The laboratory for testing packaging materials has been established and equipped, primarily for testing of fibre based materials - paper and paperboard - and to some extent for testing of plastic materials with respect to physical properties, mechanical properties in particular. Although not complete for such testing, the

laboratory is at the termination of the project able to carry out a wide range of tests which are, apart from the air conditioning, according to international standards, and which are generally accepted in trade and industry within and outside Indonesia.

A part of the equipment was already with BBIK prior to the project and is now allocated to the packaging materials testing laboratory. This equipment is listed in Annex V.

The major part of the equipment now installed has been provided for the laboratory through the UNDP contribution to the project. This equipment is listed in Annex VI.

Commercial, window mounted air conditioners have been installed in order to modify the temperature and the relative humidity of the laboratory. This conditioning reduces the temperature and relative humidity and narrows their variations, thus bringing the conditions nearer the international standard conditions for packaging laboratories. However, the present installation is not able to provide a controlled climate according to the international standards.

Most of the equipment for the laboratory for testing of primary packaging for food has been provided through the UNDP contribution, including equipment for constant temperature bar heat sealing and for vacuum/modified atmosphere packing, also including impulse heat sealing. A climatic cabinet has been delivered but not installed, due to insufficient power supply to the BBIK complex. Additional power supply was planned for installation in 1989, but no funds have yet been made available for this purpose.

At the present stage this laboratory is able to prepare flexible sample packages and evaluate shelf life decay.

Full lists of equipment installed at the laboratory for testing primary packaging of food, are reproduced in Annex V (equipment provided by counterpart contribution) and in Annex VI (equipment provided through the UNDP contribution).

The laboratory for testing primary packaging of food is not air conditioned, and the lack of climatic facilities in operation has made it possible to carry out shelf life testing of limited scientific significance only.

Basic equipment for simulation of mechanical transport conditions (impacts, compression, vibrations) and preparing of sample packages for testing has been provided for the laboratory for testing transport packaging, major parts through (counterpart funding) another through the UNDP contribution to the project. Lists of the equipment installed is reproduced in Annex V counterpart financed and in Annex VI (UNDP financed). Complete filled packaging up to 1 ton can be tested.

One essential equipment, the box compression tester arrived defective and could be brought into operation to a limited extent only.

The transport packaging laboratory is not air conditioned, and there is no standard climate preconditioning facilities in immediate connection to the laboratory. This makes it impossible to execute most testing fully in accordance with international standards. Lack of large climatic chambers which can be operated at special climates limits the possibilities of the laboratory to carry out certain tests for specific type of transport packaging, including packaging for international transport of such commodities as fresh horticultural produce and dangerous goods.

#### C. Information activity

An information function has been established as part of the packaging activity, and a representative selection of books and other documents has been provided for this function through the UNDP contribution to the project. A list of the documentation provided is reproduced in Annex VII. In addition, a range of documents has been made available for photocopying through cooperation with the Indonesian Packaging Institute. A total of ca. 200 documents are registered in the packaging library at the termination of the project.

The information function has a double purpose - to provide information for the staff of the BBIK packaging unit, and to assist in upgrading the knowledge in industry about packaging, technical and scientific understanding in particular, including knowledge about testing of packaging.

A simplified grouping system has been introduced and the documents have been registered and classified according to this



simplified system. An internal lending system has been established and lending cards produced.

Due to limited resources no periodicals were provided as part of the assistance. At the present stage of staff development this may be of minor importance. However, when a wider knowledge has been established a limited number of packaging periodicals will be required in order to keep the staff acquainted with the commercial development within packaging technology.

#### D. Accommodation

BBIK is situated in the outskirts of Jakarta, 25 km from the city centre, in Pekayon near the Jakarta Timur industrial area. Public transport to the institute is difficult and time consuming.

The accommodation made available by BBIK for the packaging unit is appropriate, and with good possibilities for future expansion. However, as mentioned above the air conditioned areas are insufficient, and the quality of the conditioning with respect to temperature and relative humidity, levels as well as variations, is inadequate to meet the requirements of international standards.

The climate in the non-airconditioned rooms, the transport packaging testing hall in particular, is not favourable to the equipment, and the greases available have proven insufficient to prevent some staining of unpainted surfaces. Moreover, the grease collects dust. This problem is most serious in the transport packaging testing hall, due to the large uncovered ventilation holes immediately under the roof. A thermal insulation of the ceiling, equivalent to min. 15 cm mineral wool bats, and replacement of the ventilation openings with windows, in combination with a vigorously administered cleaning programme, may provide an improvement to the dust problem.

A serious limitation is the present underdimensioned power installation which is incapable of supplying the equipment provided by the project. It must be foreseen that further development of the packaging unit activities will require installation of extensive power consuming equipment, climatic equipment in particular, and that such expansion, therefore, should not be implemented until adequate electrical power is installed.

### E. Staff

The staff part-time associated with the packaging laboratory activities has been organised in three groups, each headed by a laboratory manager assisted by a deputy. All managers and their deputies have been or are at the termination of the project under basic training in packaging either at the Indian Institute of Packaging or at Japan International Co-operation Agency/Japan Packaging Institute. A full organigramme of the BBIK packaging unit as at present is reproduced in Annex I. Job descriptions for all BBIK packaging unit posts are outlined in "Plan Organigramme for the Packaging Unit and Draft Job Descriptions of the Packaging Unit Staff Members". The organigramme and the job description are based on the presumption that the packaging staff members are 100 per cent employed in packaging.

The managers of the three laboratories have been intensively trained within the project through overseas training at Michigan State University, East Lansing, USA and in Brazil - the managers of the packaging materials laboratory and the laboratory for testing primary food packaging at ITAL/CETEA, Campinas and the manager of the transport packaging laboratory at IPT, Sao Paulo.

Also in the on-the-job training by the international experts the main efforts have been on training the laboratory managers and to a lesser extent, their deputies, primarily due to language difficulties in communication with other staff members, to the weaker schooling background of these members, and to the limited time which was available for training. It has been presumed that the training of the rank and file laboratory staff will then be carried out in the Indonesian language by the officers. Unfortunately to the project, the manager of the packaging materials testing laboratory was promoted and transferred to another field of activity within BBIK immediately after termination of the training.

There is an unbalance in the present staff composition with respect to the number of undergraduate/administrative staff members per graduate staff member, as compared to the work load. In service packaging laboratories there is comparatively little routine work and a high rate of graduates' work, such as external relations, planning of future activities, selection and preparation of test procedures, and evaluation, interpretation and communication of test results; the situation is reflected in the staff composition. Most foreign

institutional packaging laboratories have one or less than one undergraduate/administrative staff member per graduate.

There is another unbalance which is equally important, the unbalance between the number of staff members and the funds available for chemicals and other consumables, for documentation, for maintenance and repair of the equipment, for small accessories and equipment improvements, for materials to be tested as part of research and staff training programmes, and for travelling and industry contact. Without reasonable funds for such purposes is it not possible to keep the staff rationally employed, to develop the competence of the staff, and to create results of practical value.

The three packaging laboratories and the packaging information activity constitute the packaging unit, which is part of the Development Division for Fertilizers and Petrochemicals. Each of the four packaging activities refer directly to the Head of Division. No manager has been assigned with the function of co-ordinating the packaging unit's activities on a full-time basis, but such function may be established as part of ongoing considerations on reorganisation.

A special organizational arrangement has been set up for the packaging unit. Staff members, including the unit and laboratory management, are assigned to the packaging unit in addition to their normal functions. The time which the staff members devote to packaging varies considerably, but no staff members are 100 percent engaged in packaging. Taking into consideration the considerable gap of knowledge which needs to be bridged in the near future for making the packaging unit an activity which can contribute to the packaging development, this organization is not appropriate.

The knowledge background of the staff is weak, in general and in packaging in particular, and a substantial effort is required in order to upgrade this background. The project has provided a basic training of the middle-management in foreign packaging institutions and by international consultants, a library with considerable background information is now available, and laboratory instruments are installed which can contribute to the building up of the competence, if systematically used for this purpose. A concentrated effort is required:

1. to disseminate the theoretical knowledge obtained by the laboratory managers and that contained in the packaging library to the staff members, and
2. to establish a pragmatic knowledge based on own laboratory experience and through day-to-day co-operation with the technical staff of the packaging producing and using industries and other institutions.

This will require strong and active personal initiatives by each staff member, the laboratory managers and their deputies in particular, and a change of the present receptive and reactive, in some cases even passive, attitude of the staff and middle management, to an aggressive, self-conscious and responsible approach. The development and motivation of the staff is a precondition for any practical success of the BBIK packaging unit, and will be one of the main tasks of the new packaging unit management over the next years.

#### F. Finances

The size of the UNDP and Government financial contributions to the project set narrow limitations for the degree of perfection of the BBIK packaging unit. However, some adjustments of the contributions were made over the period of implementation, see Annex VIII, and the installation and theoretical background, although incomplete to international standards can be considered a basic initial packaging testing unit. Unfortunately, the Government contributions were late and out of phasing with the consultancies. Consequently, some of the testing procedures requesting Government funded investments or supplies could not be included in the staff training programmes.

### III. ACHIEVEMENT OF IMMEDIATE OBJECTIVES

A packaging unit has been established with the functions foreseen in the Project Document.

#### A. Packaging materials testing

A well equipped packaging materials testing laboratory has been set up partly by allocation of equipment already with BBIK, see Annex V and partly with equipment provided as part of the project, financed by the UNDP contribution, see Annex VI. The laboratory is conditioned on a 24-hours basis using commercial window type air conditioners. This arrangement reduces the temperature and the relative humidity, and limits the diurnal and seasonal variations in temperature and relative humidity, although not to the extent prescribed in international standards for testing packaging materials.

The manager of this laboratory until 14 Aug. 1989 was trained in packaging materials testing one month at Michigan State University, School of Packaging, East Lansing, USA and one month at ITAL/CETEA in Campinas, Brazil in early 1989. Moreover, the manager was intensively trained by the UNIDO Expert on Packaging Materials Testing with the agreed arrangement that the manager should transfer the knowledge to the staff in Indonesian. This procedure was chosen, mainly due to the weaker knowledge of English of the staff members. An internal training programme on packaging materials was provided for staff members who understand some English.

21 BBIK materials laboratory procedures were prepared, specified in details with reference to international standards and the equipment installed at the packaging materials testing laboratory. These methods were introduced to the manager of this laboratory. A major parts of these procedures were later translated into Indonesian with the assistance of the Indonesian Packaging Institute consultants, and introduced by the UNIDO Expert in the BBIK computer for later easy updating.

Documentation on packaging materials and their testing has been provided for the library of the BBIK packaging unit.

B. Testing primary packaging for food

Basic equipment for sealing and vacuum/modified atmosphere packaging of food in flexible packages has been provided, financed by the UNDP funds made available for the project. The equipment installed can heat seal thermoplastic materials (impulse heat sealing) as well as laminates and other combined materials with outer layers of non-thermoplastic materials (hot bar sealing).

The climate in the laboratory for testing primary packaging for food is uncontrolled, but constantly registered. This unconditioned laboratory is at present used as "normal environment". For modification of storage climates a commercial refrigerator has been provided for the laboratory, and so has a fully controlled climatic cabinet, the latter unfortunately not in use due to insufficient power supply.

Testing of mechanical properties of primary packages for food can be carried out using the universal tester installed in the packaging materials testing laboratory, and changes of weight smaller than what can be registered on the laboratory's own balance (0.01g) can, likewise, be measured on the analytical balance of the packaging materials testing laboratory. Torque testing of screw caps and lids can be carried out using the laboratory's torque tester.

Chemical testing equipment, including a gas chromatograph, is available for the testing of food packaging at the fertilizer testing laboratory located in the same building.

The equipment installed in the food packaging laboratory is listed in Annex V (allocated equipment) and in Annex VI (equipment provided by the financed UNDP contribution).

9 BBIK food packaging laboratory procedures were prepared with specific reference to the equipment in the laboratory.

The manager of the laboratory was trained one month at Michigan State University, School of Packaging, East Lansing, USA, and one month at ITAL/CETEA in Campinas, Brazil in early 1989 in testing primary packaging for food, and also including principal testing of packaging materials.

On-the-job training in testing food packaging was provided by the Expert on Food Packaging, to the manager of the food packaging laboratory and her deputy in particular, but also including other staff members. An internal training programme on food packaging in general was arranged for the staff members who understand some English.

Documentation on food packaging and testing of food packaging has been provided for the library of the BBIK packaging unit.

### C. Testing of transport packaging

Basic equipment for testing functional properties of transport packaging has been installed, partly through direct Government contribution (see Annex V) partly provided through the UNDP contribution to the project (see Annex VI). Transport conditions involving drops, horizontal impacts (shunting), compression due to stacking and vibrations can be simulated in various ways according to generally accepted standards.

In addition, equipment has been installed for closing transport packaging for testing.

The laboratory for transport packaging is not conditioned and there is no immediate access to facilities for preconditioning of sample packages for testing as required by international standards, except in the laboratory for packaging materials situated in a nearby building.

The manager of the transport packaging laboratory was trained in testing transport packaging at Michigan State University, School of Packaging in East Lansing, USA and at IPT in Sao Paulo, Brazil in early 1989. At BBIK the manager was trained by the UNIDO Expert on Testing Transport Packaging. The training at BBIK was primarily classroom training, also including other staff members with a sufficient understanding of English, whereas the overseas training was primarily of a practical nature.

Documentation on transport packaging and functional testing of transport packaging has been provided for the library of the BBIK packaging unit. This documentation also includes the international regulations for testing of packaging of dangerous products and

international recommendations for testing transport packaging for perishable food commodities.

#### D. Shelf-life testing

Most important in testing primary packaging for food is quantification of actual changes in the contents when packed in alternative packages. A taste/smell panel has been established and trained, and testing methods introduced together with other procedures for organoleptic quality assessment, e.g. of texture of food products.

Shelf life testing was carried out over a period of 4 months using a typical Indonesian small scale industry product, dodol, as a model product. The effect of the packaging materials' properties was ranked using the taste/smell panel.

Shelf life testing of other typical Indonesian food products was initiated by the Food Packaging Expert during his last mission to Indonesia.

Methods of evaluating the smell effect of packaging materials were introduced and trained with the staff.

Testing of food packaging was introduced to the food packers and the food packaging industry in seminar form as part of the consultancy of the Food Packaging Expert.

#### E. External linkages

The co-operation between the project and the EEC sponsored assistance project on upgrading of the services of the Indonesian Packaging Institute (IPI) was successful, to a large extent due to the co-operation between the international experts working on the two projects. Two of the experts worked on both projects over their lifetimes.

This cooperation resulted in intensive training of the IPI consultants in testing and interpretation of testing results and assistance from IPI to the establishment of the BBIK packaging library by making its documents available for photocopying.



A series of seminars in 3 West Java towns was carried out in the spring of 1988 as a co-operation project between BBIK, IPI and the Institute for Research and Development of Agro-based Industries, within the framework of the project.

These co-operation activities between institutions are useful as for improved personal relations and reduction of tensions. However, they have not resulted in major co-operation projects and co-ordination of activities, and they have to a high extent been established through the initiatives of the external consultants, and less by the directly involved institutions.

#### IV. UTILIZATION OF PROJECT RESULTS

Shelf life testing of various typical Indonesian small scale industry food products packed in selected types of flexible packaging materials were carried out and the organoleptic changes of the products were registered in terms of ranking. Unfortunately, due to late arrival of the conditioning equipment, the shelf life tests could not be carried out under full climatic control. However, the results showed a significant correlation between the packaging material and the organoleptic changes. These results, obtained within the last months of the project have been communicated to the relevant industries, but they have not yet been utilized in commercial packaging.

The packaging materials laboratory has carried out mechanical testing of packaging materials for industrial clients, especially fibreboard materials, using the new equipment. The transport packaging testing laboratory has tested filled fibreboard boxes, although to a limited extent only, this partly due to the defects at arrival of the box compression tester.

All three laboratories, thus, have proven their practical service ability towards the end of the project. However, the delays in the delivery of certain equipment, the delays in the training programmes and the consequent postponements of the consultancies left only little time of the short project implementation period to make practical testing.

The initial testing for industrial clients and of packaging for commercial food products were carried out under the supervision of the experts. Since the experts left a decrease in the laboratory activities has been observed.

## V. CONCLUSIONS

The project succeeded in completing its main task, the establishment of a basic unit for testing of packaging materials, primary packaging for food and transport packaging. Up-to-date equipment was installed and calibrated, testing standards were established and the staff was trained in operation of the equipment. Various training arrangements were carried out in order to upgrade the general packaging knowledge of the staff.

Major difficulties met during the implementation of the project were insufficient electricity supply for the equipment and a feeble readiness only by the staff members in engaging themselves in the project and in taking follow-up initiatives.

Various institutions in Indonesia work within the field of packaging and related areas. A permanent organizational structure is required in order to minimize duplication of expertise and equipment, and to secure the optimum utilization of the resources through co-ordination and cooperation.

Provided a proper solution is found to the electricity supply, efficient measures are taken to increase the motivation of the staff, and an appropriate nation-wide co-ordination/cooperation structure is formed a follow-up project should be established at BBIK in order to:

- upgrade the laboratories, especially the laboratory for testing primary packaging for food and the transport packaging laboratory, and
- to support the management and the staff in the establishment and accomplishment of activities which can give the staff a practical experience background and thus make the packaging unit an attractive co-operation partner for the industry and other institutions.

## VI. RECOMMENDATIONS

It is recommended:

1. to change present provisional organization of the packaging activity based on part-time allocation of staff members, to a new division, a Packaging Division, or, less appropriate, to a Packaging Section under the Development Division for Fertilizers and Petrochemicals.

In both cases the staff and the division/section management should be permanently and 100 per cent employed within the packaging activity.

Appropriate organization for such division/section would be

```
/-----\  
: Head of Packaging Division/Section :  
\-----/  
|       | /-----\  
|       | \--:Secretary :-  
|       | \-----/  
|       | /-----\  
|-----: Manager, packaging materials laboratory :  
|       | \-----/  
|       | /-----\  
|       | \--: Deputy manager, packaging materials laboratory :  
|       | \-----/  
|       | /-----\  
|       | \--: 2 laboratory assistants ;  
|       | \-----/  
|-----: Manager, primary packaging laboratory :  
|       | \-----/  
|       | /-----\  
|       | \--: Deputy manager, primary packaging laboratory ;  
|       | \-----/  
|       | /-----\  
|       | \--: 2 laboratory assistants ;  
|       | \-----/  
|-----: Manager, transport packaging laboratory :  
|       | \-----/  
|       | /-----\  
|       | \--: Deputy manager, transport packaging laboratory ;  
|       | \-----/  
|       | /-----\  
|       | \--: 2 laboratory assistants ;  
|       | \-----/  
|-----: Information Officer ;  
|       | \-----/  
|       | /-----\  
|       | \--: Information Assistant/Librarian ;  
|       | \-----/
```

It is, moreover, recommended that the positions are filled according to their specific qualifications requirements, not according to seniority or other less relevant criteria;

2. to intensify the internal training in Indonesian, of the packaging activity staff through the establishment of lecture series and study groups, the attendance of the packaging activity staff to be compulsory, based on the documentation in the library and that attained by the key staff members during their overseas training and their training by the international experts, and with the laboratory managers and their deputies acting as primary lecturers and study group leaders.
3. to reserve the remaining, small funds in the budget for the following purposes:
  - a. spares required to make the box compression tester fully operational, and
  - b. for photocopy of documents in the ITC library which were listed in the list of documents required in the work plan for the project, but which are no longer available from the publishersin that order of priority;
4. to transfer the non-expendable equipment provided for the project and financed by the UNDP contribution to the Government of Indonesia;
5. to upgrade the power supply for the packaging laboratories by:
  - a. approximately 10 kVA to make the present equipment operative, and
  - b. estimated 100 kVA required for expansion as outlined in recommendation No. 9;
6. to change the scope of the laboratory for primary packaging for food to primary packaging in general, with special attention to primary packaging based on fibre materials and plastics.

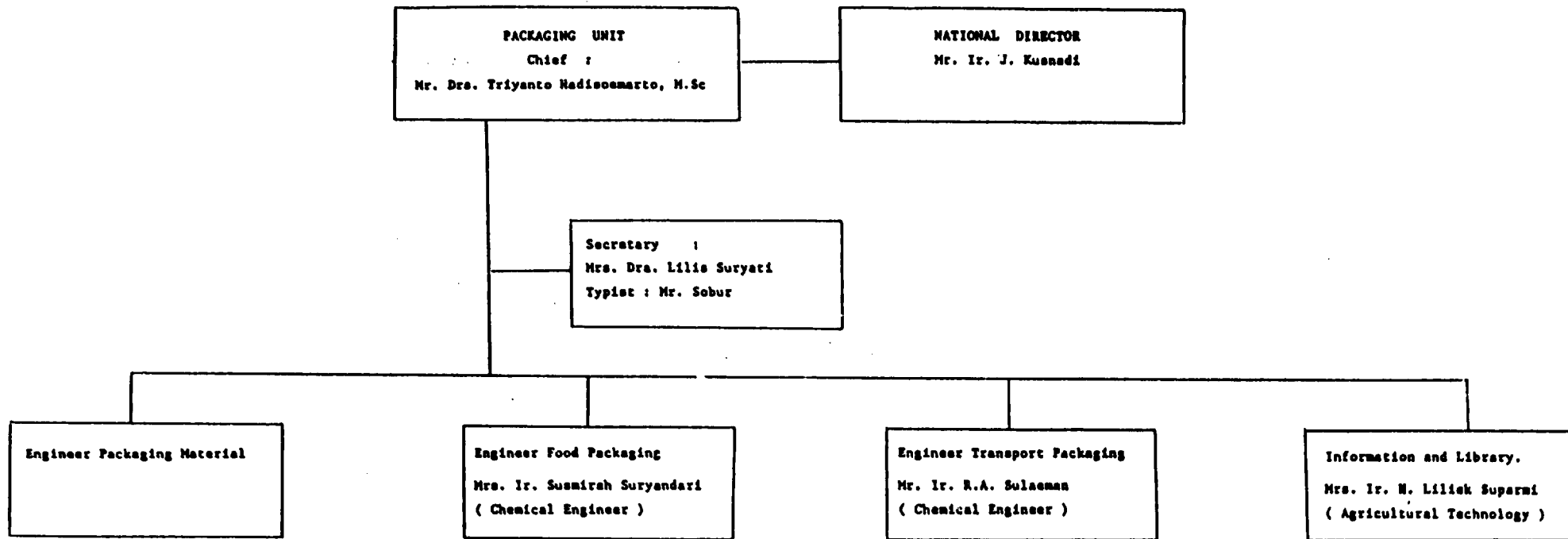
The basic problems related to physical/chemical protection of the contents, compability and adoption to distribution are parallel

for all primary packaging , and consequently there is little justification for the present limitation. In general, packaging of other categories of products than food is less complicated, and thus more apt for a new laboratory;

7. to have an indepth study carried out to elaborate recommendations for measures to upgrade the quality and the efficiency of the BBIK divisions, including measures to strengthen the management functions, e.g. through increased budget allocation authority by the institute management and through increased delegation of authority to the heads of divisions, staff adjustments, increase of responsibility to the relevant industry for the management and economics of the institute, increased revenue from services, etc. under alternative economic preconditions, not excluding possible future reduced Government contributions.
8. to promote the establishment of an advisory board with representatives from the Department of Industry, the Department of Trade and the Indonesian Packaging Federation to co-ordinate the overall planning of the packaging institutional activities, especially the activities of BBIK, PPMB and Indonesian Packaging Institute. Such advisory board should be organized under a neutral authority, such as BAPPENAS, and chaired by a neutral person familiar with the field of packaging.
9. to prepare a project for immediate extension of the packaging activity now established at BBIK with the objectives:
  - a. to expand the range of equipment to make BBIK able to offer a more complete range of tests within the fields of transport packaging, tests required for certification of packages for dangerous products in particular, and within testing of fibre based and plastic packaging materials and primary packaging;
  - b. to train the staff on industrial aspects of packaging technology, and in co-operation with various types of packaging users and producers on solving their packaging problems, and on training of their staff. Such activity could be carried out in the form of joint industry/BBIK projects assisted by international experts.

**ANNEX I**

**PACKAGING UNIT**



1. Miss. Ir. Zulfeh Munca  
( Chemical Engineer )
2. Mr. Suharto Waluyo, B.Sc  
( Bachelor of Industrial Management )
3. Mr. Bangun Sitonus  
( Bachelor of Chemical Analysis )
4. Mrs. Rosmaeni, B.Sc  
( Bachelor of Tekstil )
5. Mrs. Nelly Herawati  
( Bachelor of Industrial Management )
6. Mr. Kusnander, B.Sc  
( Bachelor of Industrial Management )
7. Mrs. Subartini  
( )

1. Mrs. Ir. Samiha Syamsudin  
( Chemical Engineer )
2. Mrs. Ir. Endang Rachmayani  
( Chemical Engineer )
3. Mrs. Dra. Lilis Suryati  
( Apotheker )
4. Mr. Soesilo Sardadi, B.Sc  
( Bachelor of Agricultural Technology )
5. Miss. Yunita Laksmiwati, B.Sc  
( Bachelor of Chemical Analysis )

1. Mrs. Dra. Eva Dasmita  
( Chemist )
2. Mr. Toton Suprpto, B.Sc  
( Bachelor of Tekstil )
3. Mr. Sujarwo, B.Sc  
( Bachelor of Production Management )
4. Mr. Supadmo  
( High School of Technical )
5. Mr. Rudi Hardi  
( High School of Technical )
6. Mr. Jamaluddin  
( High School of Technical )



**ANNEX II**

**Management, counterparts and international experts**

Title	Name	1987	1988												1989										
		Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep		
<b><u>National project management and counterparts</u></b>																									
National Project Director	J. Kusnadi																								
Chief Packaging Unit	Karyadi Joyoatmojo Triyanto Hadi- soemarto																								
Manager, Packaging Materials Laboratory	Robiatun Sarwasto																								
Manager, Food Packaging Laboratory	Susirah Suryar- dari																								
Manager, Transport Packaging Laboratory	R.A. Sulaeman																								
<b><u>International Experts</u></b>																									
Chief Technical Adviser	Kurt H. Garwin																								
Materials Testing Consultant	John Salisbury																								
Food Packaging Consultant	B.I. Turtle																								
Transport Packaging Consultant	Ernesto Pichler																								



**ANNEX IV**

**Chronological list of major documents produced by the project**

<b>Draft work plan for Implementation of the project (94 pp)</b>	<b>March 1988</b>
<b>Plan Organigramme for the Packaging Unit and Draft Job Descriptions of the Packaging Unit Staff Members (38 pp)</b>	<b>March 1988</b>
<b>Technical Report on: Implementation of the project (26 pp)</b>	<b>April 1988</b>
<b>J. Kusnadi &amp; D. Karyadi: Study Tour Report (22 pp, Annexes)</b>	<b>October 1988</b>
<b>Development of packaging physical performance test (9 pp, annexes)</b>	<b>December 1988</b>
<b>Technical report on: Development of capabilities in transport packaging (15 pp)</b>	<b>January 1989</b>
<b>Revised draft work plan for implementation of the project (54 pp)</b>	<b>January 1989</b>
<b>BBIK Packaging Unit. Registration of Information in the Library and the Show Room (13 pp)</b>	<b>January 1989</b>
<b>BBIK Materials Laboratory Procedure No.12: Taber Stiffness (7 pp)</b>	<b>January 1989</b>
<b>BBIK Food Packaging Laboratory Procedure No.1: Setting up a shelf life trial (3 pp)</b>	<b>January 1989</b>
<b>Technical report on: Progress of the implementation of the project (17 pp)</b>	<b>February 1989</b>

<b>BBIK Materials Laboratory Procedure No.3: Paper &amp; Board Conditioning of Samples (2 pp)</b>	<b>February 1989</b>
<b>BBIK Materials Laboratory Procedure No.7: Determination of the Grammage of the Component Papers of Corrugated Fibreboard after separation (3 pp)</b>	<b>February 1989</b>
<b>BBIK Materials Laboratory Procedure No.13: PIRA Rub Resistance of Printed Materials (4 pp)</b>	<b>February 1989</b>
<b>BBIK Materials Laboratory Procedure No.2: Puncture Resistance of Corrugated Board (5 pp)</b>	<b>March 1989</b>
<b>BBIK Materials Laboratory Procedure No.4: Bursting Strength of Corrugated and Solid Fibreboard (5 pp)</b>	<b>March 1989</b>
<b>BBIK Materials Laboratory Procedure No.5: Bursting Strength of Paper (5 pp)</b>	<b>March 1989</b>
<b>BBIK Materials Laboratory Procedure No.9: Thickness of Single Sheets of Paper and Board and Method of Calculation of Apparent Density of Board (4 pp)</b>	<b>March 1989</b>
<b>BBIK Materials Laboratory Procedure No.10: Thickness - Corrugated Board (3 pp)</b>	<b>March 1989</b>
<b>BBIK Materials Laboratory Procedure No.11: Water Absorption of Paper &amp; Board - Cobb Test (4 pp)</b>	<b>March 1989</b>
<b>BBIK Materials Laboratory Procedure No.14: Friction Testing (5 pp)</b>	<b>March 1989</b>
<b>BBIK Materials Laboratory Procedure No.15: Flat Crush - of Corrugated Board (4 pp)</b>	<b>March 1989</b>

<b>BBIK Materials Laboratory Procedure No.16: Edge Crush Resistance (ECT) - Corrugated Board (4 pp)</b>	<b>March 1989</b>
<b>BBIK Materials Laboratory Procedure No.22: Moisture Content of Paper and Board - Oven Method (2 pp)</b>	<b>March 1989</b>
<b>BBIK Materials Laboratory Procedure No.23: Tensile Strength - Paper &amp; Board - Constant Load Rate (3 pp)</b>	<b>March 1989</b>
<b>BBIK Materials Laboratory Procedure No.27: Wetting Tension of Plastics - Treatment Level (3 pp)</b>	<b>March 1989</b>
<b>BBIK Food Packaging Laboratory Procedure No.2: Determination of Headspace Oxygen (2 pp)</b>	<b>March 1989</b>
<b>BBIK Food Packaging Laboratory Procedure No.3: Determination of Equilibrium Relative Humidity (3 pp)</b>	<b>April 1989</b>
<b>BBIK Food Packaging Laboratory Procedure No.4: Heat sealing with the Audion TT300-S (5 pp)</b>	<b>May 1989</b>
<b>BBIK Food Packaging Laboratory Procedure No.5: Odour level in flexible packaging (3 pp)</b>	<b>May 1989</b>
<b>BBIK Food Packaging Laboratory Procedure No.6: Controlled taste test on food (3 pp)</b>	<b>May 1989</b>
<b>BBIK Food Packaging Laboratory Procedure No.7: Significance of ranked data (4 pp)</b>	<b>May 1989</b>
<b>BBIK Food Packaging Laboratory Procedure No.8: Operation of Supervac CK-183/1 (4 pp)</b>	<b>May 1989</b>
<b>BBIK Food Packaging Laboratory Procedure No.9: Determination of Screwcap Removal Troque (2 pp)</b>	<b>June 1989</b>

Draft technical report on: Establishment of the Food Packaging Laboratory (32 pp)	June 1989
BBIK Materials Laboratory Procedure No.1: Water Vapour Transmission Rate (WVTR) Determination by the Dish method (6 pp)	June 1989
BBIK Materials Laboratory Procedure No..2a: Board and Crease Stiffness Testing (8 pp)	July 1989
BBIK Materials Laboratory Procedure No.28: Heat Sealing (7 pp)	July 1989
BBIK Materials Laboratory Procedure No.29: Measurement of Relative Humidity. Assmann Psychrometer (4 pp)	July 1989
Draft technical report on: Establishment of the Packaging Materials Testing Laboratory (30 pp)	July 1989
R.A. Sulaiman: Final Report. Training of transport packaging in USA & Brazil (71 pp)	September 1989
Robiatun Sarwasto: Training in testing of packaging materials at Michigan State University, East Lansing, USA and at ITAL/CETEA, Campinas, Brazil (16 pp)	September 1989
Susmirah Suryandari: Training Report (45 pp)	September 1989
Terminal report (67 pp)	September 1989

## ANNEX V

List of non-expendable equipment provided by the government for the BBIK packaging unit, including existing BBIK equipment now allocated to the packaging unit

HQ Acq. Ref.	Item No.	Qty.	Unit	Description	US Dollar Equivalent	P.O./Shipping Advice Ref.	Received			Condi- tion	Qty. on hand	Remarks (Location)
							Qty.	U	V			
				<u>Packaging Materials Testing Laboratory</u>								
		1	PC	Tensile tester, Yasuda Seiki								
		1	PC	Friction angle tester, Toyoseiki								
		1	PC	Density column with 2 tubes, Tecan								
		1	PC	Falling dart impact tester for LD-poly- thylene film								
		1	PC	Compressor, IWATA								
		1	PC	Digital haze and turbidity meter, NIPPONDENSHOKU KOGYO NDH-20D								
		1	PC	Colour difference meter Nippon Densoku Kogyo 100/DP								
		3	PC	Cylinders for oxygen, nitrogen and carbon dioxide								
		1	PC	stop watch								
			PC	desiccators								
		3	PC	air conditioners								
		1	PC	steel ruler								
				<u>Laboratory for testing primary food packaging</u>								
		1	PC	Refrigerator								
				<u>Transport Packaging Laboratory</u>								
		1	PC	2t manual hoist								
		1	PC	sample cutting table								
		1	PC	drafting table								
		1	PC	combined incline impact tester, heavy duty drop tester and static load compres- sion tester								

HQ Acq. Ref.	Item No.	Qty.	Unit	Description	US Dollar Equivalent	P.O./Shipping Advice Ref.	Received		Com- mit- ment	Qty. on hand	Remarks (Location)
							Qty.	Y			
		1	PC	<u>Library</u> Filing cabinet for registration cards							



## ANNEX VI

## List of non-expendable equipment provided for the project and financed by UNDP contribution

HQ Req. Ref.	Item No.	Qty.	Unit	Description	US Dollar Equivalent	P.O./Shipping Advice Ref.	Received			Condi- tion	Qty. on hand	Remarks (Location)
							Qty.	M	Y			
<b><u>Packaging Materials Testing Laboratory</u></b>												
87/1	1	1	EA	MDL AB180A Analytical Balance	2,349.-	15-7-00863	1		88	G	1	
87/1	2	1	EA	MDL YF 3000 Precision Balance	953.-	-"-	1	03	88	G	1	
87/6	1	1	EA	Taber 150B Stiffness tester complete	4,558.-	-"-	1	03	88	G	1	
87/5	3	1	EA	Pickstone HT 5/95 Oven for general lab use	3,955.-	-"-	1	03	88	G	1	
87/4	1	1	EA	1555/1 Bursting strength tester for measuring the burst resistance of paper	5,220.-	15-7-0863	1		88	G	1	
87/6	2	1	EA	Model A7 Rub proofness tester	3,432.-	-"-	1		88	G	1	
87/14	1	1	EA	Puncture resistance tester for measuring on corrugated board	9,613.-	-"-	1		88	G	1	
87/4	2	1	EA	Model 1556/1 Bursting strength tester for measuring the burst resistance of board	5,577.-	-"-	1		88	G	1	
87/15	1	1	EA	Gas permeability testing apparatus for measuring permeability of packaging materials samples to gas	2,407.-	15-7-1028	1	03	88	G	1	
87/12	1	1	EA	Viscosimeter Brookfield model with dial Model L.V.F	2,839.-	15-7-0868A	1	04	88	G	1	
87/2	2	1	EA	Micrometer of bench type code ME 170 M	3,214.-	15-7-0868	1	04	88	G	1	
87/5	1	1	EA	Water vapour permeability tester Code 45 Type A incl. 4 cups x 50 cm <sup>2</sup>	2,633.-	-"-	1	04	88	G	1	
87/13	1	1	EA	Cresse stiffness tester Code ME-P with cutter	8,221.-	-"-	1	04	88	G	1	
87/2	5	1	EA	Lorentzen & Wettre strip cutter Code 142	692.-	15-7-0870	1		87	G	1	
87/14	4	1	EA	Aqua measure portable paper moisture analyser Model AM-1 complete with dual calibration programme for average & heavy density + 220 Volt battery charger#1381	1,615.-	15-7-0878	1		87	G	1	

HQ Req. Ref.	Item No.	Qty.	Unit	Description	US Dollar Equivalent	P.O./Shipping Advice Ref.	Received			Condi- tion	Qty. on hand	Remarks (Location)
							Qty.	M	Y			
<u>Packaging Materials Testing Laboratory</u>												
87/5	2	1	EA	Szstacany thermo-hygrograph 990016	596.-	15-7-0872	1		87	G	1	
87/14	3	1	EA	Heat gradient tester Model TSS No. 884	14,254.-	15-7-1115	1		88	G	1	
88/5	3	1	EA	Lorentzen & Wettre couch roller for Cobb Testing Code 146, # 64990/2	413.-	15-8-0902	1	01	89	G	1	
	4	1	EA	Code P 123 Circular cutter for 100 cm2 Circular specimen # 61230/1	473.-	-"-	1	01	89	G	1	
	5	1	EA	Attachment for ring crush test # 41489/4	396.-	-"-	1	01	89	G	1	
		1	EA	Aspiration psychrometer		15-8-0901	1	04	89	G	1	
		1	EA	Water cooler		15-8-0901	1	04	89	G	1	
		1	EA	Pin adhesion attachment		15-8-0953	1	04	89	G	1	
<u>Laboratory for testing primary food Packaging</u>												
87/1	3	1	EA	L2200P Top loading lab balance	1,321.-	15-7-0863	1	03	88	G	1	
87/11	1	1	EA	Torque tester kerk-a-torque	919.-	15-7-1027	1	04	88	G	1	
87/5	2	1	EA	Szstacany Thermo-Hygrograph 990016	595.-	15-7-0872	1		87	G	1	
88/6	1	1	EA	Supervac GK183/1 Vacuum packaging machine Serial No. 880438	2,056.-	15-8-0905	1		88	G	1	
	2	1	EA	Vacuum pump 40m3/h	811.-	-"-						
88/6	2	1	EA	TT Sealer 300 with stand	439.-	15-8-0903	1		88	G	1	
		1	EA	Environmental chamber		15-8-0904	1		89		1	

HQ Req. Ref.	Item No.	Qty.	Unit	Description	US Dollar Equivalent	P.O./Shipping Advice Ref.	Received			Condi- tion	Qty. on hand	Remarks (Location)
							Qty.	M	Y			
				<u>Transport Packaging Laboratory</u>								
87/13	2	1	EA	Gaynes 30-ER electrically operated released hook	1,510.-	15-7-0873	1		88	G	1	
87/13	3	1	EA	Gaynes 1250-V vibration tester	7,470.-	-"-	1		88	G	1	
87/8	2	1	EA	Stand stapler for stapling side walls and bottom	506.-	15-7-00863	1	03	88	G	1	
87/7	1	1	EA	Gaynes style 10,000# Compression tester 48" x 48" platens, 72" Max distance between platens, recorder range 0-5000, 0-10,000. 1HP drive motor	32,100.-	15-7-08738						arrived defective
87/2	4	1	EA	Hand operated guillotine for paper and board ref. ideal 1080 MS - including table and 80 cm cut length	966.-	15-7-00869	1		87	G	1	
87/6	3	1	EA	Soehale pointer platform scale TPE 9024 #9024.00.000	1,617.-	15-7-0879	1	03	88	G	1	
87/9	1	1	EA	Sstatecny hot air gun type forte 3	1,218.-	15-7-0872	1		87	G	1	
87/7	3	1	EA	Gaynes 125-DT Automatic drop tester with DTA-1 Gaynes corner & edge drop swivel type holding attachment	2,960.-	15-7-0873	1		88	G	1	

**ANNEX VII**

**List of documents provided by the project for the library of the BEIK packaging unit**

**ABC of good Grating**

1946, 16 pp

**Association of American Railroads**

**Access to standard information**

1486, 102 pp

**ISO**

**Accurate determination of glass container capacity**

1983, 6 pp

**Glass Manufacturers Federation**

**Benning, C.J.**

**Plastic Films for Packaging: Technology, Application and Process Economics**

1983, xiii, 181 pp, ISBN 0-87762-320-1

**Technonic**

**Boustead, P.J. & New, J.H.**

**Packaging of fruit and vegetables: A study of models for the manufacture of corrugated fibrewood boxes in developing countries**

1986, 44 pp

**Tropical Development and Research Institute**

**Brandenburg, R.K. & Lee, J.J.K.**

**Fundamentals of Packaging Dynamics, 2nd ed.**

1985, 162 pp

**MTS Systems Corporation**

Brewis, D.M.

Advances in Adhesive: Applications, materials and safety

1983, 246 pp

Worwick Publishing

Brickenkamp, C.S. Hasko., S. & Natrella, M.C.

Checking the Net Contents of Packaged Goods, 3rd ed.

NBS Handbook 132

1988, 305 pp

Superintendent of Documents

Briston, J.

Plastic in Packaging: Conversion Process

1983, 34 pp

Institute of Packaging

Bruinsma et. al.

Selection of technology for food processing in developing countries

1985, 200 pp

PUDOC

Brydson, J.A. & Peacock, D.G.

Principles of plastics extrusion

1973, 108 pp

Applied Science Publishers Ltd.

Code of Practice for Lined Carton Board and Memorandum on Pallet  
Specification

1982, 5 pp

Association of Board Makers, British Carton Association,  
British Box and Packaging Association

Containerization of Aboca in the Philippines/Japan route and its possible applications for the shipment of other fibres, particularly jute, TD/B/IPC/HARD FIBRES/20  
1980, 32 pp  
UNCTAD

Coragum laminating adhesives  
8 pp  
CPC Industries

Corrugating adhesive developments  
15 pp  
CPC Industries

Crosby, N.T.  
Food Packaging Materials: Aspects of Analysis and Migration of Contaminants  
1981, 190 pp  
Applied Science Publisher Ltd.

Dangerous Goods Regulations, 30 ed.  
IATA

Dean, D.A.  
Packaging of Pharmaceuticals  
1983, 40 pp  
Institute of Packaging

Evans, R. (ed)  
Physical Testing of Plastics  
1981, 125 pp. ISBN 0-8031-0768-4  
ASTM

European Agreement concerning the International Carriage of Dangerous  
good by Road (ADR), Vol. I - II  
1986, 521 pp  
HMSO

Expensive Confusion in dimensions  
1972, 13 pp  
Dagligvaruhandeln Erfagrupp, Stockholm

Export Packaging Note 1 - 10  
29 pp  
ITC

Export Packaging Note No. 11 - 9, Calendar of Selected exhibitions  
1988, 39 pp  
ITC

Export Packaging Note No. 12. 33 Ways to improve your packaging  
economy and avoid costly waste  
8 pp  
ITC

Export Packaging Note No. 13. Technical notes on the use of corrugated  
paperboard boxes  
ii, 29 pp  
ITC

Export Packaging Note No. 14. Technical notes on the use of metal  
cans  
i, 27 pp  
ITC

Export Packaging Note No. 15. Technical notes on the use of wooden packaging  
i, 23 pp  
ITC

Export Packaging Note No. 16. Technical notes on the use of plastic films in packaging  
i, 19 pp  
ITC

Export Packaging Note No. 17. Checklists for package planning  
i, 17 pp  
ITC

Export Packaging Note No. 18. Establishment of package specifications  
i, 8 pp  
ITC

Export Packaging Note No. 19. International Fibreboard Case Code  
i, 29 pp  
ITC

Export Packaging Note No. 20. The Arrival Condition of Export Packages from Developing Countries  
i, 11 pp  
ITC

Export Packaging Note No. 21. Guidelines for the Export Packaging of Frozen Shrimps  
ii, 28 pp

Export Packaging Note. No. 22. Reference Document on International Standardization of Selected Products, Packaging and Labelling  
iii, 144 pp



Facts about Plastic Packaging  
1983, 4 pp  
British Plastics Federation

Fibre Box Handbook  
1989  
Fibre Box Association, Chicago

Follow-up report on containerization of fibres, particularly jute,  
TD/B/IPC/HARD FIBRE/266/add 1.  
1981  
UNCTAD

Food Exports to the Federal Republic of Germany. Requirements  
Concerning Quality, Packaging and Labelling  
96 pp  
GTZ, Eschborn

Food Standards Committee Second Report on Food Labelling  
1979, 160 pp  
HMSO, London

Friedmann, W.F. & Kipness, J.J.  
Distribution Packaging  
1977, 558 pp  
R.E. Krieger

General Guidelines for the Use of Glass Containers, 2nd ed.  
1982, 24 pp  
Glass Manufacturers Federation

Griffin, R.O. et. al.  
Principles of Package Development, 2nd. ed.  
1985, 378 pp, ISBN 8-87055-465-4  
AVI Publishing Co, Inc.

Guide to corrugating adhesive  
31 pp  
CPC Industries

Guidelines for Can Manufacturers and Food Cannery: Prevention of Metal  
Contamination of Canned Foods  
1986, 82 pp  
FAO

Handbook of Cartonboard and Carton Test Procedures  
1984, 24 pp  
British Carton Association

Handbook on procurement of paper and board: A practical guide for  
buyers in developing countries, 2nd ed.  
1987, 14 pp  
PRODEC

Handling, storage and transport of frozen foods  
1982, 28 pp  
Australian Frozen Food Council

Harvey, T.D.  
Manual on Wooden Packaging  
1986, 114 pp  
ITC

Home Trade Packaging Standards  
1980, 52 pp  
British Fibreboard Packaging Association

International Convention on Carriage of Goods by Rail  
(OIM), Annex 1 (RID)  
OCTI

International Maritime Dangerous Goods Code, Vol. 1 - 5  
1988, ISBN 92-801-1231-7  
IMO

Jackson, J.M. & Shinn, B.M.  
Fundamentals of Food Canning Technology  
1979, 406 pp  
AVI Publishing Co. Inc.

Know Your Plastics  
1980, 186 ppp  
Plastics Institute of Australia

Krause, A. et. al.  
Plastics Analysis Guide. Chemical and Instrumental Methods  
1983, 369 pp  
Carl Hanser Verlag

Labelling Requirements for Consumer Package of Fresh Vegetables  
1984, iii, 82 pp  
Produce Marketing Association

Labuza, T.P.  
Shelf-Life Dating of Foods  
1982, 500 pp  
Food and Nutrition Press, Inc.

Lopez, A.  
Complete Course in Canning, 12 ed., Vol. I - III  
1981, 1056 pp, ISBN 0-930027-03-5  
Canning Trade

Manual on Export Packaging of Handicrafts  
1987  
Korea Design and Packaging Center

Manual on the packaging of fresh fruits and vegetables  
1988, 241 pp  
ITC

Manufacture and Control of Measuring Containers. Notes for the  
Guidance of Inspectors  
1977, 16 pp  
Dept. of Prices and Consumer Protection

Memorandum on Bulk Packaging of Tea  
1979, 22 pp  
ITC

New, J.H.  
Sack filling: Methods and equipment  
1975, 8 pp  
Tropical Development and Research Institute

Ordering of Glass Containers  
1975, 5 pp  
Glass Manufacturers Federation

Oswin, O.R.  
Package Life: Theory and Practice  
1983, 38 pp  
Institute of Packaging

Oswin, O.R.  
Plastic Film and Packaging  
1975, 214 pp, ISBN 0-85334-6410  
Applied Science Publishers Ltd.

**Packaging Stations for Fruits and Vegetables**  
1973, 308 pp  
International Institute of Refrigeration

**Palletization and Containerization of Bananas: Case Study from Central America and Caribbean to Gulf Port of USA and Europe.**  
TD/B/IPC/BANANA/8.  
1982, 31 pp  
UNCTAD. Trade & Development Board Committee on Shipping

**Paulson, W.**  
**Planning a Corrugated Container Plant, 2nd ed.**  
1980, 117 pp  
TAPPI

**Peleg, K.**  
**Produce Handling, Packaging and Distribution**  
1985, ISBN 0-87055-466-2  
AVI Publishing Co., Inc.

**Performance Testing of Shipping Containers**  
1985, 240 pp  
ASTM

**Ports of the World**  
84 pp  
Insurance Company of North America

**Post-harvest losses in quality of food grains.**  
**Food and nutrition paper No. 29.**  
1983, 104 pp  
FAO

**Quality Control in the Glass Containers Industry**  
1977, 32 pp  
Glass Manufacturers Federation

**Rationally designed packaging for everyday commodities**  
1980, 23 pp  
Dagligvaruhandelns Erfagrupp, Stockholm

**Ready to sell unit**  
1982, 20 pp  
Dagligvaruhandelns Erfagrupp, Stockholm

**Recommendations for chilled storage of perishable produce**  
1979, 148 pp  
International Institute of Refrigeration

**Recommendations for the processing and handling of frozen foods, 3rd ed.**  
1986, 418 pp  
International Institute of Refrigeration

**Recommended practices. Care and maintenance of automotive packaging machinery and storage and handling of empty corrugated fibreboard boxes**  
1976, 4 pp  
Fibre Box Association, Chicago

**Recommended Practices. Storage, maintenance and application of adhesives used in conjunction with automatic packaging machines**  
1976  
Adhesive Manufacturers Association

Recommended methods for loading of furniture in closed cars and protection of equipment. Pamphlet No. 15.  
1979, 25 pp  
Association of American Railroads

Rogers, J.L. & Binstead, R.  
Quick frozen foods: The commerce and technology of processing, packaging and distribution  
1972, xvi, 520 pp, ISBN 0-900379-0-22  
Food Trade Press

Rosa, M.A.  
Corrugating Defect Terminology, 4th ed.  
1982, 232 pp, ISBN 0-89852-403-2  
TAPPI

Sacharow, S. & Griffen, R.C.  
Principles of Food Packaging, 2nd ed.  
1980, 452 pp, ISBN 0-87055-347-X  
AVI Publishing Co., Inc.

Selected ASTM Standards on Packaging  
1984, 234 pp  
ASTM

Selin, J.  
Packaging in the cottage Industries for Domestic and Export Markets  
1975, 20 pp  
ITC

Selin, J.  
Role of Packaging in the Distribution System  
1983, 11 pp  
ITC

Selin, J.  
Selected Background Information on Marketing of Packaging Materials  
and Machinery to Developing Countries, 2nd ed.  
1985, 52 pp  
ITC

Selin, J.  
Some Aspects of Export Packaging in Developing Countries  
1976, 17 pp  
ITC

Selin, J.  
Some Aspects of Export Packaging of Furniture  
12 pp  
ITC

Selin, J.  
Some Aspects of Packaging for Transport  
1979, iii, 29 pp  
ITC

Selin, J.  
The Importance of Packaging Graphic Design for Exports  
1982, 20 pp  
ITC

Sherman, G.A.  
Skin Packaging Simplified: A New "how-to" approach  
1982, 32 pp  
Allied Automation Inc., Sergeant Packaging Machinery Div.

Shipper's Guide to Stowage of Cargo in Marine Containers  
1982, 144 pp  
Maritime Administration



Specifications, tolerances and other technical requirements for weighing and measuring devices. NBS handbook 44  
1982, 200 pp  
Superintendent of Documents

SSCI Guide for Export Shipper of Hazardous Materials  
1985, 16 pp  
Stell Shipping Container Institute

Standard Sealing Tests for Closures  
6 pp  
British Plastics Federation

Strength and Performance Standards for Carbonated Beverage Bottles,  
2nd ed.  
1979, 20 pp  
Glass Manufacturers Federation

Swalm, C.M.  
Chemistry of Food Packaging  
1974, 109 pp  
American Chemical Society

Training of Engineering Craftsmen in the Glass Industry  
17 pp  
Glass Manufacturers Federation

Troedel, M.L.  
Current Technologies in Flexible Packaging  
1986, 105 pp  
ASTM

**Voluntary Collection of Plastics**

**4 pp**

**British Plastics Federation**

**World Packaging Congress 1989**

**New Trends in Packaging for Asia/pacific Countries**

**1989, 112 pp**

**Cahners Exposition Group**

**Wyatt, V.**

**From sand-core to automation: A history of glass containers**

**1978, 24 pp**

**Glass Manufacturers Federation**

ANNEX VIII. Project expenditures and financing

Government Contribution

	Total budget (Rps)			Expenditures (Rps)		
	PRODOC	Latest revision	1/7-87 to 31/8-89	1/7-87 to 31/3-88	1/4-88 to 31/3-89	1/4-89 to 31/8-89
1. : PROJECT PERSONNEL						
15 : Travel	6,299,000	6,521,000	6,491,000	2,952,000	1,902,000	1,637,000
17 : Salaries and Wages, National Experts	12,155,000	10,985,000	8,439,000	2,050,000	4,635,000	1,754,000
19 : Component Total	24,384,000	17,506,000	14,930,000	5,002,000	6,537,000	3,391,000
30 : TRAINING						
39 : Component Total	1,185,000					
40 : EQUIPMENT						
41 : Expendable Equipment		5,789,405	5,038,405	1,736,405	3,053,000	249,000
42 : Construction		17,224,585	11,707,210		5,724,585	5,982,625
49 : Component Total		23,013,990	16,745,615	1,736,405	8,777,585	6,231,625
50 : MISCELLANEOUS						
59 : Component Total	4,500,500	19,231,397	15,655,079	5,398,369	4,438,938	4,767,772
99 : GRAND TOTAL	30,069,500	59,751,397	47,330,694	13,136,774	19,803,523	14,390,397

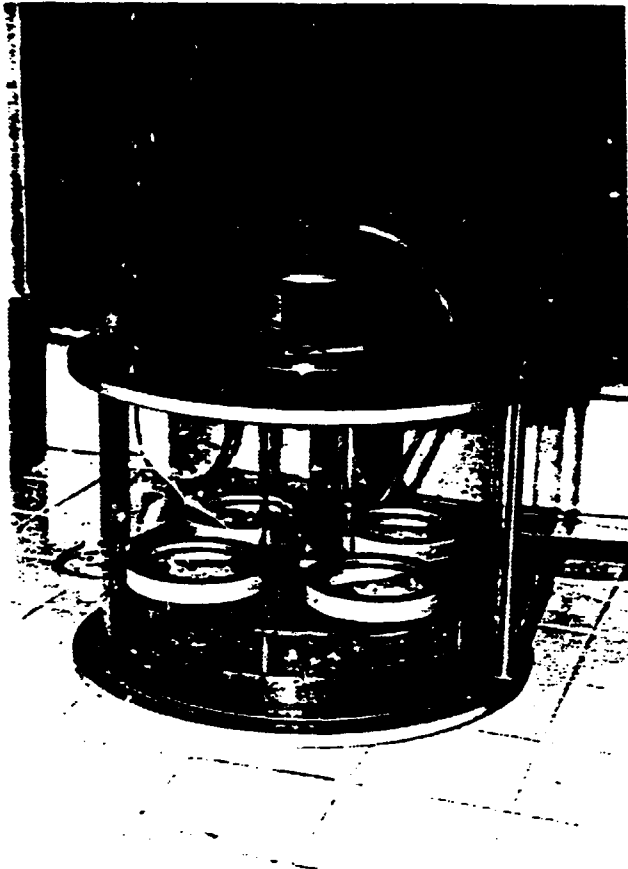
UNDP Contribution

	Total Budget				Expenditures							
	: PRODOC		: Latest revision		: 1/7-87 to 31/8-89		: 1/1 to 31/12-87		: 1988		: 1/1 to 31/8-89*)	
	m/m	USD	m/m	USD	m/m	USD	m/m	USD	m/m	USD	m/m	USD
10 : PROJECT PERSONNEL												
11 : EXPERTS												
11-01: Chief Technical Adviser	7.0	47,600	7.0	62,880	7.0	64,431	0.3	3,500	4.1	37,380	2.6	23,601
11-02: Expert in Materials Testing	3.0	20,550	3.0	32,062	3.0	32,062					3.0	32,062
11-03: Expert in Food Packaging	3.0	20,900	3.0	25,239	3.0	38,352					3.0	38,352
11-04: Expert in Transport Packaging	3.0	20,550	3.0	22,058	2.2	25,933			1.6	18,058	0.6	7,875
11-99: Sub Total	16.0	109,500	16.0	152,239	15.2	160,828	0.3	3,500	5.7	55,438	9.2	101,890
12 : Administrative support		8,000		8,000		7,141				4,394		2,747
19 : Component Total		117,600		160,239		167,969		3,500		59,832		104,637
30 : TRAINING												
31 : Individual Fellowships		27,000		49,079		50,612				11,170		39,442
32 : Group Training		12,750		16,557		16,701				16,557		164
33 : In-Service Training		1,300		1,300		1,300						1,300
38 : Adjustment against Prior Years						(11,324)						(11,324)
39 : Component Total		41,050		66,936		57,289				27,727		29,562
40 : EQUIPMENT												
41 : Expendable Equipment		5,000		4,027		4,049				4,027		22
42 : Non-Expendable Equipment		132,000		171,427		171,465		133,422		38,002		221
48 : Adjustment against Prior Years				(2,222)		(3,589)				(2,222)		(1,467)
49 : Component Total		137,000		173,229		172,095		133,422		39,807		(1,224)
50 : MISCELLANEOUS												
51 : Operation & Maintenance of Equipment		4,350		3,000		2,368		1,200		776		392
59 : Component Total		4,350		3,000		2,368		1,200		776		392
99 : UNDP Total Contribution		300,600		403,404		399,631		138,122		128,142		133,367

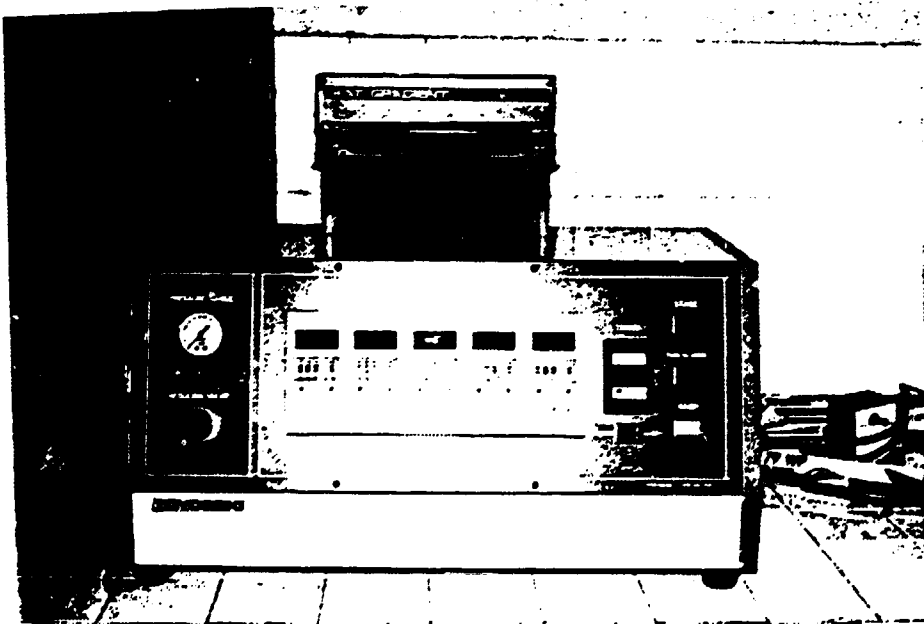
\*) including obligations

ILLUSTRATIONS

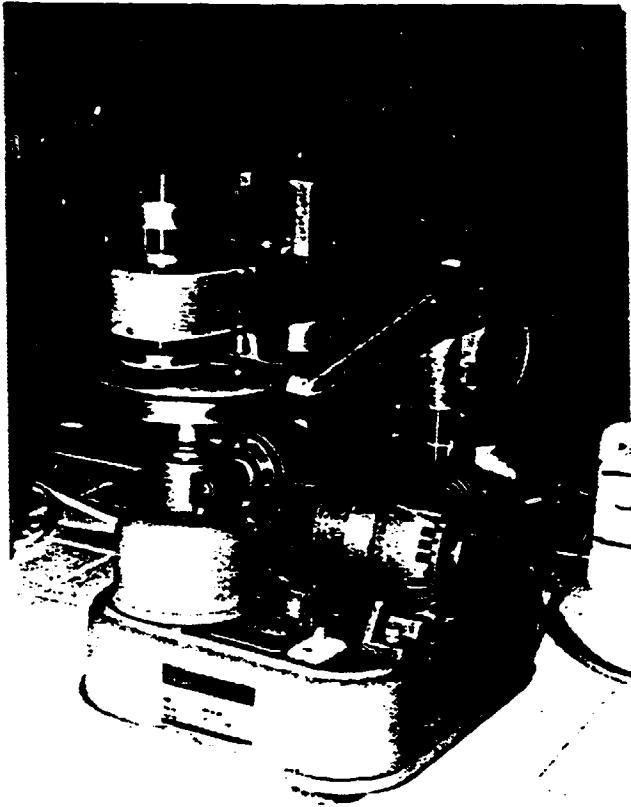
Packaging Materials Testing Laboratory



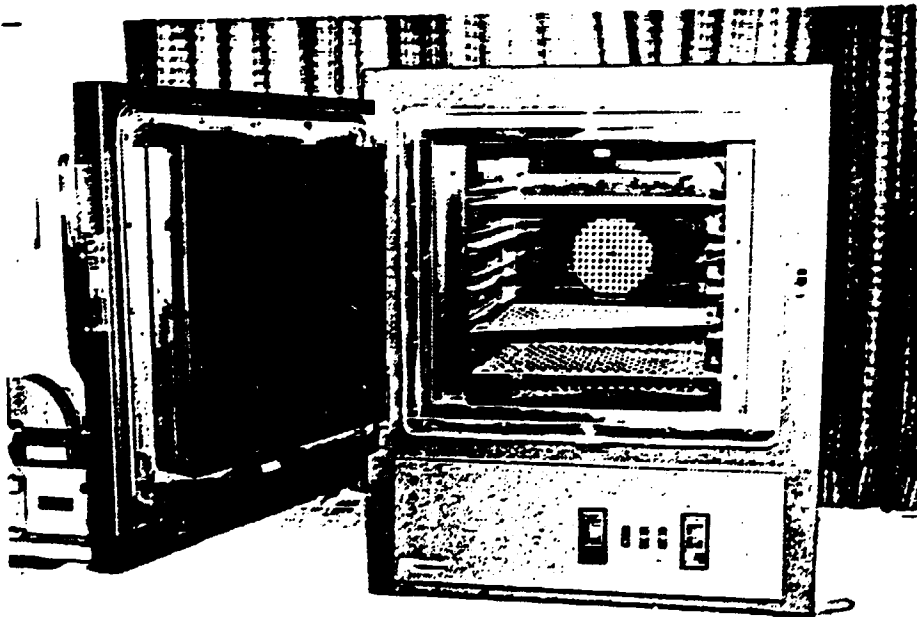
Water vapour permeability tester



Gradient heat seal tester



Rub proofness tester



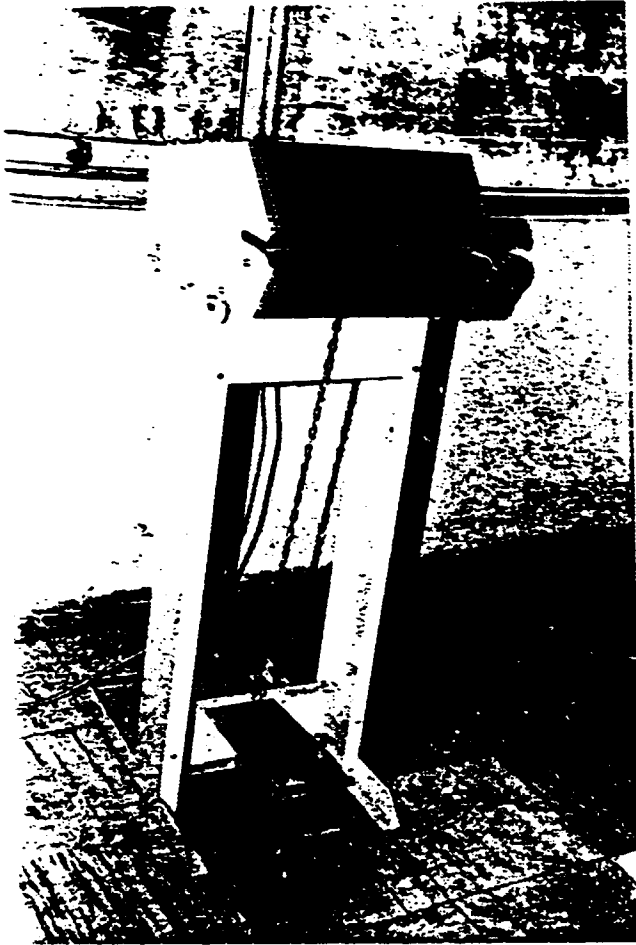
Pickstone oven



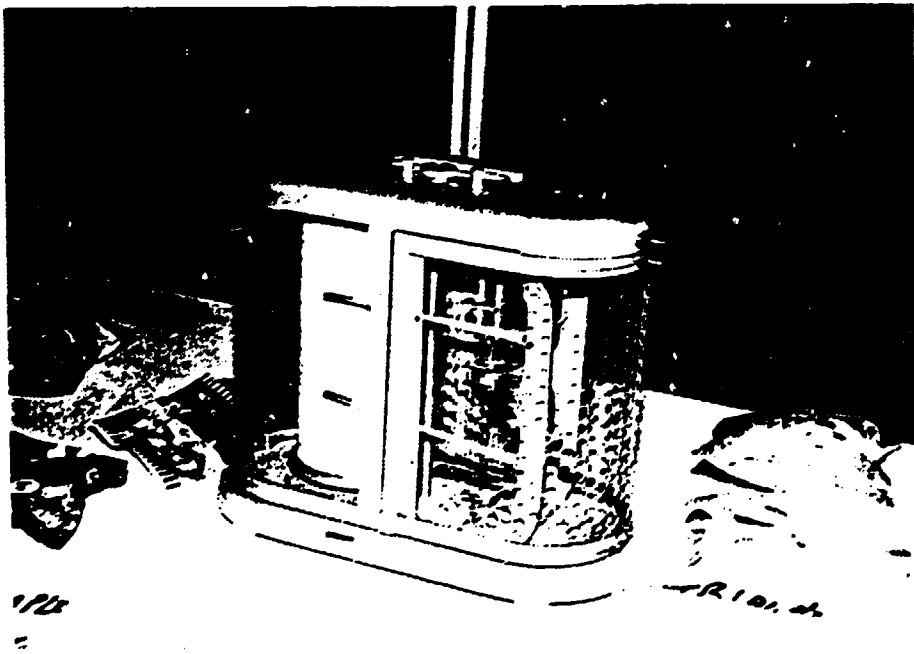
Climatic cabinet



Vacuum packer

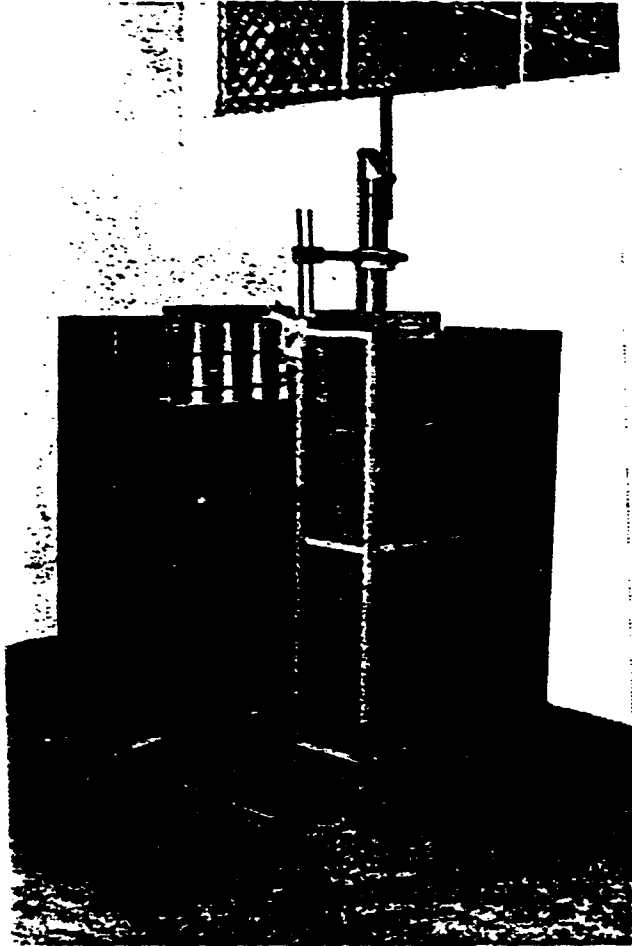


Bar heat sealer

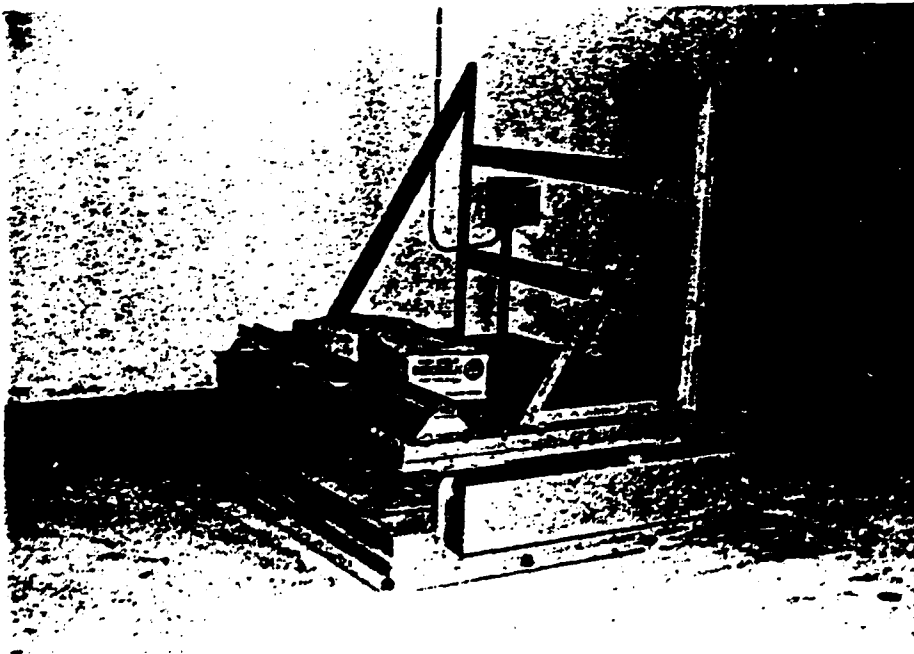


Thermonygrograph

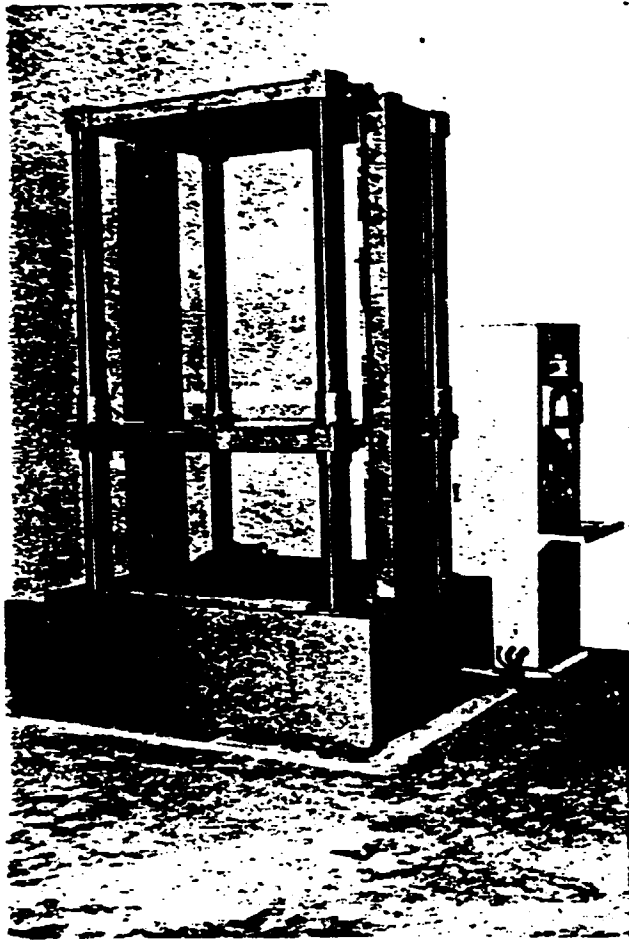




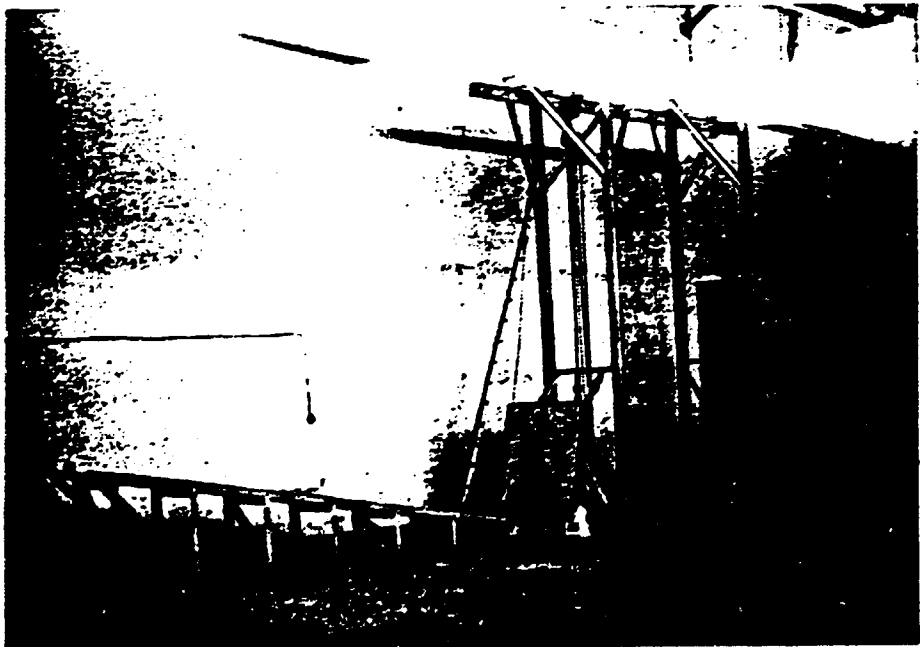
Automatic drop tester



Vibration table



Box compression tester



Incline impact tester and heavy duty drop tester