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# **INTERNATIONAL FORUM ON APPROPRIATE INDUSTRIAL TECHNOLOGY**

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.....  
**WORKING GROUP No.10**

**APPROPRIATE TECHNOLOGY  
FOR THE MANUFACTURE OF  
PULP AND PAPER PRODUCTS**

.....  
**PAPER, CARDBOARD, CORRUGATED CARDBOARD,  
POLYETHYLENE SHRINK AND STRETCH FILM FOR BETTER PACKAGING ,  
Background Paper .**

**PAPER, CARDBOARD, CORRUGATED CARDBOARD,  
POLYETHYLENE SHRINK AND STRETCH FILM  
FOR BETTER PACKAGING**

by

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## CONTENTS

Chapter		Page
1.	THE FUNDAMENTAL IMPORTANCE OF PACKAGING IN A MODERN ECONOMY.	1
2.	THE DECISIVE ROLE OF SUPERMARKETS IN THE MODIFICATION OF PACKAGING SYSTEMS.	2
3.	NECESSITY FOR PROVISIONAL PLANNING BY COMPANIES USING PACKAGES.	7
4.	USE OF DIFFERENT PACKAGING MATERIALS IN RELATION TO TECHNICAL AND ECONOMIC FACTORS.	13
5.	THE GLOBAL CONCEPT OF PACKAGING.	14
6.	THE USE OF PAPER, CARDBOARD, CORRUGATED CARDBOARD, POLYETHYLENE SHRINK FILM AND POLYETHYLENE STRETCH FILM IN PACKAGING.	16
7.	DIMENSIONS AND PRODUCTION CAPACITY OF INDUSTRIAL PLANTS FOR THE PRODUCTION OF "BASIC RAW MATERIALS" FOR PACKAGING, WITH SPECIAL REFERENCE TO PAPER, CARDBOARD, CORRUGATED CARDBOARD, AND POLYETHYLENE FILM.	21
8.	DIMENSIONS AND PRODUCTION CAPACITY OF INDUSTRIAL PLANTS FOR THE PRODUCTION OF PAPER, CARDBOARD, CORRUGATED CARDBOARD AND POLYETHYLENE SHRINK AND STRETCH FILM PACKAGING.	31
9.	PACKAGING PROBLEMS CONCERNING SOME SECTIONS OF AGRICULTURE AND INDUSTRY.	40
10.	FINAL CONCLUSION AND OPERATING SUGGESTIONS.	46

1. THE FUNDAMENTAL IMPORTANCE OF PACKAGING IN A MODERN ECONOMY.

On a world scale, packaging is one of the most important sectors of the modern economy even though it would not be obvious from a cursory examination.

1.1. The many Components.

The fact remains that packaging involves an impressive movement of capital, an unknown, but exceptionally large number of industries operating in one or more sectors directly or indirectly dealing with packaging (machines, raw materials, finished packages, etc.) in all countries, and an equally large number of technicians, experts, workers, consultants, research workers and designers throughout the world who deal with the many questions composing the kaleidoscope that is packaging.

The statement that modern civilization as we know it, and that many products would not exist at all without packaging is a simple, undeniable truth.

In fact, with very few exceptions, packaging is the last, indispensable link in every chain of agricultural or industrial activity without which the joint efforts of many people would be in vain.

2.

THE DECISIVE ROLE OF SUPERMARKETS IN THE MODIFICATION  
OF PACKAGING SYSTEMS.

We should remember that a considerable thrust in this direction was produced, starting with the nineteen sixties, by the gradual introduction of supermarkets modifying the existing sales systems and the entire philosophy of selling.

It has been stated repeatedly that the introduction of the supermarket has considerably altered the habits and customs of those persons - mainly women but also men - who, in the family organization, devote themselves to the purchase of consumables. It can be added - and this is the most significant feature for us - that the supermarket has brought about a real revolution in the packaging of the different products marketed.

In the recent past, thirty years ago, a large part of the goods sold in traditional stores was unpacked. Wine and oil were sold directly from the barrel; rice, sugar, maccaroni, beans and flour were contained in large sacks, normally 100 pounds each. Biscuits were packed in tin boxes each holding several pounds; sweets were sold loose; jams and marmalades were contained in wooden barrels; meat, salted meats, cheese and butter had to be cut on the spot.

Obviously, this required one or more assistants who serve the customers with the things they needed.

The supermarket means the replacement of the shop assistant, while creating a new type of relationship between purchaser and store.

The customers can walk freely through the various departments, buy or walk away without buying, or examine the products of different brands, qualities and prices displayed on the shelves. It is a real delight to look at these packages with their attractively designed panels printed in many colours, arrays of cans, boxes and bottles.

The customer will immediately notice that all products are packaged. No goods are sold loose. The weight and price of each product are stamped on the package. Only fresh fruit and vegetables, and not in every case, are packed in the supermarket itself.

The customer who, at the time when the traditional stores were the only trading point - and some still survive, but will be transformed gradually according to the new system - used to choose a brand or an item according to the influence or advice of an assistant, now finds himself apparently alone when choosing a product in a supermarket. Attention should be called to this statement "apparently alone", since it has been proved that the purchase of a product is never a random operation.

New elements have replaced the traditional shop assistant and tend to hidden guidance and influence on the customer's choice.

2.1. Supermarkets and New Sales Techniques.

It is now practical to try to examine, though superficially, the different factors that influence a customer in his purchasing.

2.1.1. The purchaser must satisfy a specific need, therefore, when he goes to a supermarket, he knows beforehand what items to buy (sugar, meat, flour, frozen food, butter, oil, etc.).

2.1.2. The purchaser appreciates, or already uses, a certain brand or quality. His purchasing will follow a clearly defined line.

2.1.3. The purchaser goes to a supermarket without a specific shopping list.

2.1.4. This same purchaser has no preference for a specific brand or quality.

Now is the moment to ask the following question:

"What are the new and most significant elements which, apart from these exceptions, can exert a more or less hidden influence on the customers' choice ?".

Here is the answer:

2.1.5. Advertising for the launching or support of a new brand or a specific product, carried out through all the traditional media such as radio, television, cinema, newspapers, magazines, publications, posters and billboards, luminous displays and others.



- 2.1.6. The attractive appearance of the package, colours and graphic design. The appeal of many packages, and especially food packages, is exerted by depicting the product, as it will appear when served, in gay colours or with perfect printing and has a decisive influence on consumer choice in the majority of cases.

The recent introduction of transparent heatshrinkable or stretch plastic films has permitted a further and more sophisticated evolution of this idea. The new system and material, whilst giving adequate protection to the various products, allows the purchaser to see the goods inside without risk of error or confusion.

Therefore we can say that a promotional package, pack shape, convenience and functionality, and attractive external printing, are all elements contributing to the merchandizing of a product.

It can actually be stated that a suitable package plays the role of hidden persuader in the sale of the product. Obviously, advertising and packaging complement each other, and it is not easy to determine the limits of their mutual influence.

The display boxes, promotional packages, and plastic bags, which in the past had been used only to contain - often unsuitably - certain products, are now used as protection of, and publicity for the contents.

2.2. Main Features for Good Promotional Packages.

To recapitulate, we may say that a proper promotional package in line with the requisites of the new sales techniques, must comply with the following characteristics:

- 2.2.1. Attract the customer's attention in a split second, since the item is sold in direct competition with other products and packages.
- 2.2.2. Be able to tell the consumer what he wants to know.
- 2.2.3. Give simple and direct information.
- 2.2.4. Suggest good quality and satisfy the buyer.
- 2.2.5. The profile should not mislead and no inexact information should be given.

- 2.2.6. Must arouse longing for possession.
- 2.2.7. It must sell the goods.
- 2.2.8. It should be produced of size and shape unlikely to cause difficulty in arrangement on special supermarket shelves or in the consumer's store cupboard.
- 2.2.9. Be manufactured with suitable material, resistant to any possible compression during transit or on the shelves in the supermarket or in the consumer's store cupboard.
- 2.2.10. Therefore, the manufacturers of the various products must tackle the problem of giving an attractive appearance to their merchandise adequately, in the light of these new distribution techniques: above all, the automatic packaging of these products must be considered since aesthetics and design cannot be separated from each other. A good final result depends on the total joint effort made toward the achievement of a single end.

2.3. Shipping and Transport Systems and Packages.

Every planning, production, marketing and trading action would be frustrated if the various industrial or agricultural products could not be dispatched to the final user, wherever he may be located, in perfect condition i.e. meeting the consumer's requirements, expectations and wishes.

Any incoming product in bad condition or deteriorated, always causes - besides the inevitable complaints with consequent requests for discounts, reductions or, in marginal cases, the complete rejection of the consignment - a negative reaction from the customer, which often leads to the loss of the customer, and sometimes of the market. The consequences can easily be appreciated.

The decisive importance which the various systems and materials used in the production of adequate shipping and transport packages have assumed in the modern economy from this premise. These systems and materials can be used alone or in combinations, in order to obtain satisfactory, and sometimes sophisticated results.

During the thirty years following the end of the war, the industries throughout the world producing or using shipping and transport packages manufactured from various materials have been able to improve their techniques and experience.

The quality of these packages has now reached a high degree of safety, and it is sufficient to comply strictly with the ruling manufacturing methods and provisions to obtain a final result free from risks or unpleasant surprises. This with the possible exception of possible accident or average due to circumstances beyond the shipper's control.

It is also necessary to undertake a survey of the means of transport to be used (land, sea and air), the climatic conditions to be faced, the duration, and systems of loading and warehousing, methods of loading and unloading, the eventual use of loading pallets and other load stabilization methods.

3. NECESSITY FOR PROVISIONAL PLANNING BY COMPANIES USING PACKAGES.

It has been ascertained that in many circumstances the problems of packaging are tackled by the users in an empirical and rudimentary way.

This frequently causes inconvenience since many goods are received in bad condition. Most of the responsibility for this inconvenience must be attributed to the failure to design a suitable package which, had it been organically manufactured, would certainly have limited or eliminated a large part of the trouble.

To give a clear explanation of the importance of "package planning" which calls for team work involving a number of persons operating within the company, though in different fields, we describe below a procedure for tackling and solving the packaging problem organically.

3.1. Procedure Suggested for Planning Suitable Packages.

Each Company using packages of any type and size must have a "Technical Package Dept." devoted to technological research, study of the materials available on the market in relation to the Company's needs, and charged with maintaining operational relations with other company sectors.

This Office may also consist of one person, or preferably several technicians and experts.

The procedure proposed concerns a medium-size Company. Obviously, this procedure may be applied to bigger Companies or, with adequate modifications, to small industries where very few persons are charged with several responsibilities.

A point of the first magnitude is that a certain goal should always be kept in view i.e. the necessity to study, design and test suitable packages in relation to the duties they are manufactured for. Only this will minimize risks and eliminate failures.

The procedure proposed is as follows:

- 3.1.1. General Management Meetings, to discuss the preparations of new samples and products. These meetings will be attended by the managers of the Company departments involved, namely:

Research Department;  
Production Management;  
Commercial Management;  
Advertising Department.

It is advisable that the "Technical Package Department" (usually subordinate to Production Management) participate briefly, during this phase, in the preparatory work by collecting data and furnishing general and detailed advice which may facilitate the planning of the new product, i.e. the finished product must have first-grade packaging features.

In fact, in several Companies it has happened that new products devised by imaginative designers, and mass-produced, have created big packaging problems during the final stage, interfering with the entire production cycle. This is due to lack of co-ordination during designing.

- 3.1.2. Presentation of Prototypes of New Products. Modifications and corrections, if any. Their approval by the Management.
- 3.1.3. Meeting of the "Technical Package Department" with the Commercial Management and the Advertising Department to examine and discuss, for each new item, the following issues:
  - 3.1.3.1. Whether the product shall be contained primarily in promotional packages.
  - 3.1.3.2. If yes, preliminary selection of the material for manufacturing the promotional package.
  - 3.1.3.3. Necessity to protect the product in the promotional package from shocks, compression, abrasion, humidity, heat, dust, light and corrosion.
  - 3.1.3.4. Printing and advertising for the promotional package.
  - 3.1.3.5. Package sealing: glue, gummed or adhesive paper tape, tape or string binding, stapling, heat sealing, cold wrapping, and labelling.
  - 3.1.3.6. The product contained in the sales package will be shipped by the piece; in this case a transport package is required. Cushions, inner partitions, or inforcements for protection against vibrations and shocks will be studied as necessary.

- 3.1.3.7. The product in the promotional package will be shipped in multiple pieces in the various combinations dictated by the Commercial Management; this in connection with the sales campaign and the demand. Also in this case proceed as in point 3.1.3.6.
- 3.1.3.8. The product will not be contained in a primary promotional package, but is shipped in multiple pieces in a shipping package. Proceed as described in 3.1.3.6.
- 3.1.3.9. The product, which may or may not have a primary presentation package will be forwarded on pallets as a single piece or grouped into several units. The entire load on the pallet will be suitably protected and secured using an LD polyethylene shrink film overwrap (portable gun or furnace) or with an LD polyethylene stretch film applied cold using the appropriate machine.
- 3.1.3.10. Means of transport used: Company trucks, groupage service or full freight; railroad, truck loads or piece goods; sea; air.
- 3.1.3.11. Shipping place, at Home or Abroad. Export Overseas. Distribution systems. Warehouses and storage. Palletization and inplant transport. Organization of various distribution stores, representatives and sale agents.
- 3.1.4. Processing of the Data collected by the "Technical Package Department".
- 3.1.4.1. Study of the most suitable materials to be used. The study of the most suitable materials to be used will be conducted, particular preference being given to materials which may be easily destroyed or recycled after use, or used again in order to save fuel and raw materials.
- 3.1.4.2. Study of inner protection systems possibly required to protect the packaged products against shocks, vibration, dropping and tilting. Emphasis of what we said in point 3.1. 4.1.

Obviously a package dropped from a height results in partial or total breakage of the product; in this case it must be classified as "average" and also adequately treated with respect to carrier's responsibility, and insurance.

In fact, it is not always economical to design a package that can also withstand this type of accident. It is clear that, if

the value of the packaged goods is quite high, measures can be taken to ensure maximum protection at adequate cost.

- 3.1.5. Study of the most suitable package sizes and types in relation to the following points:
  - 3.1.5.1. Number of pieces packed in one package as requested by the Commercial Management.
  - 3.1.5.2. Evaluation where compatible with the Company needs, of package type and size in relation to the best utilization of the materials used to manufacture the package, in order to reduce scrap. Evaluation as above, in relation to the equipment of the package suppliers and to their manufacturing systems.
  - 3.1.5.3. Co-ordination with the Production Management, so that the selected package offers quick and easy fitting, filling and sealing in the factory.
  - 3.1.5.4. Standardization of sizes, so as to enable adequate and rational palletization.
  - 3.1.5.5. Necessity of emphasizing weight limits and overall dimensions in relation to special dispatching systems (parcel post).
- 3.1.6. Manufacturing of sample packages to be carried out directly by the "Technical Package Department" if provided with the necessary equipment. If not possible, samples will be manufactured by the normal suppliers who will receive full particulars and, where possible, scaled technical drawings from the "Technical Package Department". In this latter instance, we recommend the strictest technical co-operation with the suppliers, discussing the results obtained and supplementing them with suggestions and advice.
- 3.1.7. The checking of various types of sample packages, their manufacture, material used, size and, above all, their capability of containing the product adequately. Testing of possible inner partitions and cavities. Testing of package sealing.
- 3.1.8. Testing of sample packages empty or filled with new product prototypes (take care that these prototypes are identical to the mass production), through simulated laboratory tests in compliance with existing rules and the selected procedures.

3.1.9. Modifications and corrections. The above tests will be conducted with emphasis on those meeting the particular requirements of each package and in relation to the required performances. These tests will gather useful information about the strength of the outer package and the conformity of any inner protection.

Therefore, during this stage it will be possible to make all the alterations and corrections necessary to have a perfectly functional package.

3.1.10. The application of the polyethylene heat shrink film packaging method will lead to the simplification of many of the above operations owing to the great sizing and dimensional flexibility offered.

3.1.11. Experimental shipment to external branches and storehouses of limited sets of new packages with products, using various means of transport.

These packages will be returned to sender without having been opened. This will allow the "Technical Package Department" to check wear and strength of the transport package and the behaviour of the inner protection.

Should the packaged products suffer damage, the package will be re-designed, taking care to modify or reinforce those parts which gave unsuccessful results during the trial.

In this case the package will be subjected, totally or partially, to the tests described above.

3.1.12. Final Meeting between the "Technical Package Department" and the Production Management and the Commercial Management, to present the final sample packages designed, developed and tested in compliance with the provisions described, and ready for application. Approval of samples.

Meeting with the Advertising Department for external lettering, indication of contents, and of "fragile product" if required.

3.1.13. The issue of Purchase Specifications accompanied, where possible, by technical drawings and any necessary directions for use.

These specifications will be used by the Commercial Management (Purchasing Dept.) for the negotiation and definition of terms, on a strictly technical basis, with Suppliers.



The Production Management (Quality control), will also use these specifications to inspect the incoming goods on a strictly technical basis.

3.1.14.

The issue of Technical Specifications concerning each single package, complete with all materials provided for internal protection. Assembly drawings of internal parts. Filling and sealing drawings. Directions for palletization.

These Specifications will be used by the Production Management to deliver the necessary instructions to the departments concerned with product packaging, so that these operations are conducted accurately and within the scheduled time.

This procedure may be altered, extended or reduced according to the requirements of the Companies using packages.

The basic idea, that the packaging to be used, which is the final link in any chain of production operations and is the culmination of the efforts aimed at product perfection, be designed and planned in advance with technical and scientific precision remains unchanged.

4.

USE OF DIFFERENT PACKAGING MATERIALS IN RELATION TO  
TECHNICAL AND ECONOMIC FACTORS.

On the basis of the information in chapter 3. the ideal objective for a Company using packages would be to plan the requirements of materials and manufacturing equipment, or any other apparatus required for the production of good packaging beforehand. Finally the only job left to do would be to place orders with the suppliers.

Though this procedure may be easily applied in a country with Companies capable of covering any kind of request, difficulties may be encountered in countries where Companies manufacturing machines and materials for the production of packages only cover a small part of the market, in the light of the quality produced.

In this event, imports from overseas become a must, and this is not always possible, or the application of a certain type of system, or material must be temporarily deferred while waiting for it to be produced locally.

Consequently, in every country where the economy is developing, each new Company intending to use packages of any type in its future activity - few are the Companies that can do without packaging - should also consider this important final link in the chain of production operations during the planning of the new plant.

Nowadays, the packaging industry is able to produce an extremely wide range of items from different raw materials which are often linked to specific conditions and traditional sources of supply.

A sufficient example is paper, which is produced from cellulose, a raw material that will become a very precious product in the eighties, or plastic materials, inseparable from petroleum, or tinsplate or aluminium, which require complex production plants with high investment costs.

5.

## THE GLOBAL CONCEPT OF PACKAGING.

This is a relatively new idea which has already been applied in the German Federal Republic, Great Britain, Sweden, and the USA for some years. As the expression itself suggests, the packaging of a certain type of product must be considered in its entirety. The process of bagging and packaging begins the instant the product has acquired the form, aspect and definite properties coinciding with the final image the customer knows and requires.

5.1.

### Automatic Packing.

In our discussion in Chapter 3., we stated that packaging may be simple or complex, that it may be limited to a little modest protection or that it may be sophisticated, or it may require simple, elementary manual operations or involve automatic machinery, lines and systems.

To make things clear, during the nineteen forties, packing often meant a piece of newspaper that the shopkeeper used to wrap the goods in.

Today, this is a thing of the past and packing is effected directly by the producer.

The point is, when we consider the many implications connected with this, the final stage of production, it is essential that the problem be faced and solved in "global" terms.

5.2.

### Management Economy.

Not only is it necessary to emphasize the different packaging materials used, but, on examining the practical aspect of the final purpose to which they will be put and their behaviour on the various machines, it is useful to exploit the management economies which may be achieved in the use of manpower and application times.

As we mentioned in Chapter 3., warehousing before and after still enter into the field of this examination, as do the means of transport used, insurance costs, climatic conditions, the requirements of the final consumer or user and the stock turnover times.

Finally, we should remember an extremely interesting factor for the general economy of all nations and which few businesses take into account and apply.

5.3.

Economy in the Use of Fuel and Raw Materials.

This is the concept of using all resources to the best advantage which will be the yardstick for producers and users of packaging during the nineteen eighties when certain raw material and energy problems will have become more acute and waste, which often occurs today, will be prohibited.

Each package will have to be carefully redesigned, and then the idea of "Global Packaging" will certainly be to the forefront for study, research, debates, and.... application.

There will be a great number of elements to be introduced into this "operating memory" with the aim of obtaining an ideal solution that takes every possible variable and combination into account.

This is a complex problem and certainly cannot be dealt with fully in a few words. We have mentioned it here so that it may be recorded and extended in relation to all possible industrial initiatives to be undertaken in the field of packaging. This demonstrates the great complexity of this sector yet again.

6. THE USE OF PAPER, CARDBOARD, CORRUGATED CARDBOARD, POLYETHYLENE SHRINK FILM AND POLYETHYLENE STRETCH FILM IN PACKAGING.

Paper, cardboard, corrugated cardboard, polyethylene shrink and stretch films are materials that play an important part in the packaging field.

This goes for small, or presentation packaging, but is especially true of transport packaging.

6.1. The Supplementation of Corrugated Cardboard with Heat Shrink and Stretch Polyethylene Film.

At this point, it behoves us to explain that the packaging system using polyethylene shrink and stretch film has been included in this study as a follow up to the subject of corrugated cardboard since the new method represents the supplementing or, in many cases, the replacement of corrugated cardboard which held unrivalled sway in the packaging sector for many years.

6.2. Guide to the Planning of New Industrial Plant for the Production of Raw Materials for Packaging.

It is perfectly clear that the expression "basic raw materials" may indicate elements used from time to time in several phases or cycles of production.

6.2.1. In the paper, cardboard and corrugated cardboard field, the "basic raw materials" may be considered to be:

6.2.1.1. Water.

6.2.1.2. Trees.

6.2.1.3. Cellulose.

6.2.1.4. Wheat straw.

6.2.1.5. Bagasse.

6.2.1.6. Rolls of paper of different quality used for the manufacture of corrugated cardboard which, in its turn, constitutes the "basic raw material" for finished packages.

6.2.1.7. Different types and qualities of cardboard.

- 6.2.1.8. Paper, cardboard, and used packages of the same are now considered as "basic raw materials" inasmuch as that they are recycled to become paper and cardboard once again, and hence "basic raw materials".
- 6.2.2. In the polyethylene shrink, and stretch film field, the basic materials may be considered to be:
  - 6.2.2.1. Petroleum.
  - 6.2.2.2. Ethylene.
  - 6.2.2.3. Polyethylene pellet.
  - 6.2.2.4. Extruded polyethylene film.
- 6.2.3. Before the erection of a technically and economically feasible plant of any size, the industries specialized in the production of "basic raw materials" must conduct detailed studies of the problems mentioned below in order to ensure the availability of a series of conditions:
  - 6.2.3.1. Reliable and continuous supply of necessary raw materials throughout the year.
  - 6.2.3.2. A technical guarantee that the available raw materials be suitable for the production programmed and the machinery installed.
  - 6.2.3.3. Geographical and territorial location of the sources of supply of the various raw materials required. Study of alternatives to obviate possible supply difficulties, resulting from circumstances beyond the manufacturer's control. This problem should be studied in detail where basic raw materials are imported from Abroad.
  - 6.2.3.4. Evaluation of the estimated mean annual requirement should be made according to programmed sources of supply.
  - 6.2.3.5. It is necessary to make a comparative assessment of the means and systems of transport to be applied according to the distances to be travelled and the climatic conditions at the point of departure, en route, and at destination (ports, canals, mountain passes closed during winter, rainy seasons, snow drought, strike action, etc.), transport conditions, especially ports, including possibility of loading and unloading delays, in order to formulate a programme making the points mentioned in point 6.2.3.1. operative.

- 6.2.3.6. The economic assessment of all the elements quoted above in order to obtain a series of useful information for the accurate formulation of the final costs of products.
- 6.2.4. The territorial location of the new plant, taking the following elements into account:
- 6.2.4.1. The geology of the land in relation to the machinery to be installed.
- 6.2.4.2. The climate of the area in relation to the type of production envisaged.
- 6.2.4.3. Constant water supply of the type and quantity required according to the type of production planned.
- 6.2.4.4. Constant motive force of the power and quantity required according to the type of production planned.
- 6.2.4.5. Constant supply of the quantity and quality of fuel oil required according to the type of production planned.
- 6.2.4.6. Constant supply of all other sundry materials required according to the type of production planned. Easy spare parts replacement is required.
- 6.2.4.7. The availability of qualified management and technical staff, and manpower according to the type of production planned.
- 6.2.4.8. Availability of unspecialized manpower according to the type of production planned.
- 6.2.4.9. Availability of dwellings, public transport services, and adequate social services for the personnel mentioned in points 6.2.4.7. and 6.2.4.8. and their respective families.
- 6.2.4.10. The territorial location of the new plant in relation to potential Home and Foreign users. Transport, existing or improvable connections, and whether they are passable throughout the year.
- 6.2.4.11. The design and erection of new industrial installations, carried out with the intention of safeguarding the surrounding countryside and obviating as far as possible that the new industry have an adverse effect on the original natural

- environment. Too many mistakes have been made in Europe and the United States, even in the recent past. This should serve as a guide, and a lesson in order that past mistakes shall not be repeated.
- 6.2.5. Availability of know-how, licenses, or patents where required, or in any case, the acquisition of all essential technical information required for starting up production. Reference to home or international consultants. The eventual participation of foreign industries, especially to obtain new manufacturing methods, or technologies.
  - 6.2.6. Study and advance solution of all problems deriving from working liquor, smoke, smells, unpleasant noises, industrial discharges of all types, and the defence of the natural surroundings.
  - 6.2.7. Market research with the scope of identifying the following elements:
    - 6.2.7.1. The absorption of the "basic raw material", by potential users, to be produced keeping in mind:
    - 6.2.7.2. The technical requisites (quality - machines on which such materials are to be worked - format required - special features - conformance to given specifications or standards).
    - 6.2.7.3. The economic and commercial factors applicable (mean selling price - territorial distribution of possible Home and Overseas buyers and the burden of transport costs to the various destinations - mean annual order which could be placed by such users and the comparative estimate calculation of the production capacity of the new plant in proportion to the figures for potential user absorption presumed - terms of payment normally applied - Home and Foreign competition).
  - 6.2.8. A pre-survey to detect the economic viability of the new Company from the "costs and revenue" angle and connected problems.
  - 6.2.9. The financing required. Procedures necessary in order to obtain financial aid from national and international organizations.
  - 6.2.10. Once the first research and survey phase has been completed, it will be possible to obtain a considerable amount of information which will be useful for the fuller investigation of part of the entire project in later phases.



We should remember that, in order to proceed, it is essential that the study be further extended and that no element which enables us to make the final decisions with a minimum of risk be neglected, the various components which are the basis of any serious industrial project having been drawn up beforehand.

This is dealt with in Chapter 7. following which examines another subject of primary importance.

7. DIMENSIONS AND PRODUCTION CAPACITY OF INDUSTRIAL PLANTS FOR THE PRODUCTION OF "BASIC RAW MATERIALS" FOR PACKAGING, WITH SPECIAL REFERENCE TO PAPER, CARDBOARD, CORRUGATED CARDBOARD, AND POLYETHYLENE FILM.

The basic raw materials in the paper, cardboard, corrugated cardboard and Polyethylene film sector were given in points 6.2.1. and 6.2.2. From that list, it is clear that a production cycle may begin at different points.

7.1. The Main "Basic Raw Materials" for Paper, and Cardboard Production.

On considering the paper and cardboard sector, we observe that trees are the best and most important natural source of materials for making paper products.

Other sources exist apart from trees (wheat straw, bagasse, waste paper, etc.) but they are quantitatively and qualitatively inferior.

Departing from this premise, we may state that the ideal solution would be to plant an industry for the production of the main basic raw materials in the form of a complete cycle installation in the middle of a richly forested area with excellent water supply. Obviously subject to the condition that the premises given in points 6.2.3. to 6.2.10. be maintained.

In reality, conditions of this sort do exist in a few parts of the world, so much so that important industrial complexes have been situated for a long time in Canada, Scandinavia, the Soviet Union, the United States, and elsewhere, and include the entire production cycle starting with the tree trunk and passing through the various phases - cellulose production, or wood pulp, semichemical pulp production - to rolls or cut sheets of paper of several types and qualities which are used in the packaging industry.

7.2. The Problem of Infrastructures.

However, there are regions in various parts of the world which are richly forested and watered but devoid of paper mills capable of exploiting such wealth. The reasons for what might be called this incongruence are many, and may not be readily identified. One of these may be attributed to transport and communications difficulties, unbearable climatic conditions and the lack of infrastructures.

Hence, the indications given by points 6.2.3. to 6.2.10. are pertinent to the correct approach to the problem.

7.3. An Example from the Soviet Union.

A typical example of this occurs in the Soviet Union where vast expanses of resinous forest land in Siberia which could furnish suitable raw materials for high production capacity paper mills (one thousand metric tonnes per day per production unit) in plenty are unexploited for this very reason, and especially for the difficulties in communication between the virgin forest area and populated industrial areas. Two possible solutions to this problem are given below.

- 7.3.1. One or more production units capable of transforming timber into paper products, or at least into cellulose or wood pulp, could be installed in the middle of the forest area.

This presupposes that a suitable water supply and an efficient communications network with access to the forest area by several roads and railway lines be available in the area, since they are essential if constant supplies of basic raw materials are to be ensured for each production unit.

This solution confers a reduction in transportation costs for basic raw materials since the distance between the forest and the transformation units would be restricted to a maximum radius of 500 kilometers.

- 7.3.2. The road, rail and water communications between the forest area and existing or projected paper mills in other parts of the country in areas where climatic, infrastructural, and manpower problems may be solved more readily should be improved. In this case, the cost of handling and transport would be greater, but the conclusion would be equally worthwhile.

- 7.3.3. The example referring to the Soviet Union, which has a controlled economy whilst having great commercial possibilities, and which takes the trouble to exploit the wealth of the vast territories it occupies, is given purely as an example to illustrate the great complexity of these problems. A lengthy series of surveys and programming of large capital and qualified manpower investments are essential if they are to be well exploited.

7.4.

#### Floating Paper Mills.

Another significant example is presented by the project, drawn up and currently being made operative by an American industrial group, for the construction of the world's first paper mill to be installed and operate on board a suitably equipped ship.

The new system, which is revolutionary for the paper industry, will enable the paper mill to be installed initially in Amazonia on the River Jari, which flows through the densely forested area that is the Munguba district of Brazil.

The basic raw material will be readily obtainable whilst the finished products (prevalently cellulose) will be loaded onto special cargo ships for delivery in other areas for transformation and use.

The project has been thoroughly studied right down to the problem of waste waters in order to obviate any form of environmental pollution.

The mill is twice the length of a football pitch and as high as a sixteen storey building, has 55.000 KW installed power and will be able to produce 750 metric tons of bleached Kraft pulp daily in 1980.

Nine railway networks leading from the river deep into the forest have been opened to supply the plant, whilst 80 million fast growing trees will be planted to replace the trees felled and sent to the paper mill.

The ship carrying the paper mill will be anchored in the river by means of 4.000 piles driven into the bed and welded to the keel.

The total investment will amount to over 250 million dollars when the project is completed.

This is a classic example of a paper mill, of a new and absolutely original type, which is installed in the middle of an area where exploitable basic raw materials abound, even when the area is difficult to reach by traditional methods.

7.5. Preliminary Conclusions.

We may trace a preliminary general outline of the principal basic raw materials for paper and cardboard on the basis of the points mentioned so far.

7.5.1. It is obvious that a complete cycle industrial installation in the paper and cardboard sector should be located in a geographical area where the availability of the various elements and conditions given is assured.

7.5.2. The production capacity of each installation, considering the cost of the plant, running and ammortization costs, will be great, ranging from a minimum daily output of 500 to a maximum of 1.000 metric tonnes of cellulose which may be processed immediately at a nearby mill into rolls of paper for further use.

7.5.3. Such a complex will be able to serve clients and users thousands of kilometers away with ease, considering the compact nature of the finished products and the high specific weight thereof which render transport costs by land and sea competitive.

7.6. A Problem of Convenience.

At this stage, we may pose the question of the convenience of installing new factories for the production of cellulose, paper, and cardboard, and the production capacity limits, in areas which clearly do not have the ideal general features and details mentioned previously.

It may so happen that a country which has always imported the greater part of its cellulose, paper and cardboard requirements from Abroad decide to become self-sufficient. An expansion of national industries may also bring about an increase in the internal consumption of cellulose and therefore should be considered.

A reply to this may be formulated as follows.

7.6.1. Those nations which are in the happy position of having extensive tracts of forest land and excellent water supplies are in a position to process the most suitable timber to produce various paper products, cellulose and rolls and cut sheet paper ready for use under the most favourable conditions.

This is at internationally competitive prices even to users afar.

- 7.6.2. The paper mills located in the countries mentioned previously in point 7.6.1. have repeatedly expressed their intention to reorganise production in the future to bring about an increase in finished product exports (paper, roll paper or cut sheets) at the expense of other products such as cellulose, wood pulp, semi-chemical pulp, etc. which constituted the bulk of business in the past.

This means that certain paper mills, either old established or located in countries which do not produce cellulose and which totally rely on imported materials will face a serious crisis if the producer nations apply their intentions to the letter, or if they sell cellulose at very high prices.

Without doubt, cellulose will be very important and very much in demand during the nineteen eighties.

- 7.6.3. The recommendations to be formulated on the basis of the information given are very straightforward, as follows:

- 7.6.3.1. It is advisable that all conditions and hindrances examined be studied, assessed, compared and controlled before deciding whether to undertake an industrial enterprise for the production of paper and cardboard on the basis of principal basic raw materials destined for use in the production of packaging at a later stage.

- 7.7. The "Basic Raw Materials" for Paper, Cardboard, and Corrugated Cardboard.

The decisive rôle played by some principal basic raw materials in the modern economy and on a worldwide scale has been examined. The line of action being taken by countries which, owing to a particular geographical position, are in the enviable position of being able to dictate certain commercial policies in the specific case of the exportation of finished products at the expense of cellulose or wood, or semi-chemical pulp has been stressed.

The necessity for the advance planning of installations for the production of paper, cardboard, and corrugated cardboard packaging taking the factors discussed into account arises from these provisions which have been announced recently and chiefly concerns developing countries.

Hence a pre-survey should be conducted to stress the types of paper, cardboard, and corrugated cardboard packaging that local users are likely to require, planning such study to cover a period of five to ten years.

The final performance required of each type of packaging from a technical point of view must be clearly defined by this survey. It is obvious that corrugated cardboard boxes to be used for export must be manufactured with high resistance Kraftliner manufactured with wood pulp.

On the contrary, corrugated boxes for use in home trade over short distances and by suitable means of transport may be produced with paper derived from waste paper. The same study will be turned to the examination of other applications, small, medium, and large capacity paper sacks, and folding boxes, shipping boxes, and containers generally.

Thus, it will be possible to obtain an initial indication of which will be useful for compilation of the general programme. The following points, especially, must be emphasised.

- 7.7.1. The presumable quantitative demand, for paper, and cardboard fabricated mainly from new pulp, from local user industries.
- 7.7.2. The presumable quantitative demand, for paper and cardboard fabricated exclusively from wheat straw, from local user industries.
- 7.7.3. The presumable quantitative demand, for paper and cardboard fabricated exclusively from bagasse, from local user industries.
- 7.7.4. The presumable quantitative demand, for paper and cardboard fabricated exclusively from waste paper, from local user industries.
- 7.7.5. The presumable quantitative demand, for paper and cardboard fabricated exclusively with a composition of wheat straw and waste paper or other mixture of these or other components, from local user industries.

Those in charge of the programme will be able to identify and apply the most appropriate solutions on the basis of the indications collected.

Problems concerning the manufacture of "basic raw materials" of a primary nature from resinous trees, cellulose or any new

pulp material have been outlined in previous points. The discussion of the other raw materials quoted in points 7.7.2., 7.7.3., and 7.7.5. may be useful at this point.

7.8. Paper Mills Specialised in the Production of Paper and Cardboard using Raw Materials other than Cellulose, Wood Pulp or Semi-chemical Pulp.

The use of raw materials other than cellulose, wood pulp, or semi-chemical pulp in the production of paper and cardboard for the production of packaging permits easier technical and economic solutions in many cases.

The application of the research methodology indicated by points 6.2.3. to 6.2.10. is also required in this case especially to determine the full and constant availability of the raw material required, be it wheat straw, bagasse or waste paper, and also to emphasise the other aspects of the operation.

7.8.1. Paper produced from wheat straw is best suited to the production of fluting in corrugated cardboard. This paper is wound on rolls of machine width varying from 180 to 250 cm., and external diameter from 80-125 cm., total weight of each roll, from 130 to 240 Kg. The weight of paper of this sort varies from 130 to 240 gm. per square metre according to the requirements of the final users.

Bagasse may be used as an alternative to straw in the manufacture of paper having technical features and use possibilities substantially similar to those of straw, described in point 7.8.1.

7.8.2. Waste paper may also be used for the production of corrugated medium, and as an alternative to straw or bagasse paper. However, it should be pointed out that this paper, when used as a corrugated medium, will be technically less resistant than paper produced exclusively from wheat straw. It is often used for the production of composition pulp in conjunction with wheat straw and waste paper, special additives which improve the final characteristics of the paper thus produced often being used.

7.8.3. Waste paper is mainly used for the production of roll paper for corrugated cardboard, applied as external or internal liner of the cardboard itself. Where the waste paper is of first quality and derived from paper or cardboard made of new cellulose, the final product of the recycling will also be of good quality and have technical features permitting special applications.



If, instead, the waste paper used is derived from a heterogeneous mixture of newspaper, magazines, chipboard, and corrugated cardboard, the resultant paper will be of medium quality and used in the manufacture of corrugated cardboard as internal or external liner where packaging with particularly resilient qualities is not required.

7.8.4. Waste paper may also be used in the manufacture of cardboard destined for use as packaging. The information given in point 7.8.3. concerning the technical features of corrugated cardboard also apply here to the final product.

7.8.4.1. Here it behoves us to mention a point concerning the final destination of waste paper containers and folding boxes. Many European and Extra-European countries have recently promulgated laws forbidding the use of cardboard manufactured from waste paper for packages in direct contact with food.

7.8.5. Paper mills suitable for the production of the types of paper and cardboard described from the materials mentioned present simpler installation, management, investment and production capacity problems than other mills that convert primary "basic raw materials".

That this type of paper mill may be set up in any region on condition that the general rules already mentioned in points 6.2.3. to 6.2.10. be applicable is worthy of special mention, bearing in mind the following:

7.8.5.1. The water used for manufacturing must be of the quality and quantity required. The water itself may be recycled inside the plant, thereby obtaining considerable reduction in the delivery of fresh, clean water and partially, or totally solving the problem of the discharge of polluted water to the outside, which would have an adverse effect on the natural environment.

7.8.5.2. Where the raw material to be used is wheat straw or bagasse, the sources of supply should be located within a radius of no more than 50 to 500 Km. from the mill, assuming that transport may be by either road or rail.

7.8.5.3. Where the principal raw material to be used is waste paper, it is essential that the sources of supply be located within a radius of 50 to 200 Km. from the paper mill. Alternative dislocated sources may also be used, including foreign

sources, the material being imported by land or sea. In this case, it is essential that the paper mill be equipped with capacious storage dumps and have suitable handling equipment for moving bales of waste paper, and able to ensure continuous service.

It may be useful to increase the collection of salvage on a local basis where much waste paper and cardboard is lost. Important salvage campaigns have been sponsored, often in schools, by Rotary Clubs, National Packaging Institutions, and other Bodies, with the full support of Governmental Authorities in many European countries, Canada, and the United States.

This is an extremely valuable method of safeguarding the environment and saving raw materials and fuel resources.

- 7.8.5.4. The final users of this particular quality of paper product must be situated within a radius of 50 to 600 Km. of the mill.
- 7.8.5.5. The production capacity of each paper mill, which, ideally, should produce manufactures based exclusively on one type of raw material, should range from a minimum of 50 tonnes per twenty-four hour working day to a maximum of 150 to 200 tonnes per day.
- 7.8.5.6. The manufacturing plants using the types of raw materials described are not especially complex or sophisticated. This allows the employment of relatively unspecialised staff when starting up a new plant. A group of qualified technicians capable of running the plant competently whilst gradually training unqualified staff is also required.
- 7.8.5.7. A paper mill equipped for the working of the special materials discussed and producing the quality of paper indicated may require an investment of about 3 million dollars where production capacity is 50 tonnes per day, employing 3 technicians and 20 workers, the figures being increased in proportion to the production capacity when the latter is of higher value.

7.9. Basic Raw Materials for the Production of Polyethylene Film.

The basic raw material, in the absolute sense of the word, is petroleum, since this is the raw material from which the many plastic materials, including polyethylene film used for packaging, are derived.

7.9.1.

Here we should emphasise that, in contrast to paper and cardboard production where it is essential that mills be located as close as possible to sources of the raw materials they use, the refineries which transform crude oil, from which ethylene, a by-product of the cracking process in petroleum refining and which is the basis of polyethylene pellet is derived, may be sited in areas and countries a distance from oilfields.

The transportation by sea of crude oil in petrol tankers of various displacement and capacity simplifies the entire problem to a considerable extent. The refineries treating petroleum produce ethylene from which, at a later stage, high density polyethylene pellet, which is the basic raw material for the production of polyethylene shrink and stretch film used in packaging, is produced.

7.9.2.

Refineries are normally industrial installations of considerable size requiring heavy financial investments and special infrastructures which are particularly necessary for crude oil discharge and storage operations. Problems connected with the protection of the environment and the pollution of the surrounding district (waste water and the exhalation of fumes and smells) are particularly important.

Installations such as these are able to ensure constant supplies of low density polyethylene pellet, which is normally palletized in 25 Kg. bags or delivered in bulk by special size trucks, if stored in silos, to Users and manufacturers of the final product of all sizes, even when they are situated a considerable distance from the point of origin. Lots of palletized bags of pellet are often exported to all parts of the world by land and sea.

8. DIMENSIONS AND PRODUCTION CAPACITY OF INDUSTRIAL PLANTS FOR THE PRODUCTION OF PAPER, CARDBOARD, CORRUGATED CARDBOARD AND POLYETHYLENE SHRINK AND STRETCH FILM PACKAGING.

The various problems inherent to the production of basic raw materials were examined with special reference to paper, cardboard, corrugated cardboard and polyethylene in Chapter 7.

In this chapter, the various aspects of the transformation of basic raw materials into finished packaging, ready to be used by the final user will be discussed.

8.1. Paper Packaging.

Paper, which until fifteen to twenty years ago was an essential and irreplaceable packaging material in many cases and often utilized alone, has undergone a considerable evolution recently. This coincides with the introduction of laminates which, whilst keeping paper as the basic material, enables us to obtain new materials having better, and completely different technical features from paper alone. Such laminates use paper as the basic material, coupling it with other products such as aluminium, plastic materials, special resins, various types of wax, etc.

8.1.1. Therefore, paper as a single item has an ever more restricted use in the packaging sector, such as in the production of small, medium and large capacity bags. In this sector, too, there has also been a move towards the use of laminates of paper and other materials, especially for large capacity bags.

Paper is still used simply as a complementary element in many types of packaging, having a consequent accessory function.

8.1.2. Paper used as a single element in the packaging sector may be produced of primary basic raw materials or of less valuable raw materials. Much depends on the final use and the technical characteristics required. However, it is advisable to remark that the paper used as a basic element for the production of laminates is always produced with primary basic raw materials.

8.1.3. It is worth remembering that existing legislation in many European and Estrauropean countries regulates, often stringently, the properties of paper which is to be in direct contact

with foodstuffs, and dictate precise restrictions pertinent to the "basic raw materials" and other components which are forbidden for use in manufacture.

8.2. Cardboard Packaging.

Cardboard used for packaging has maintained a more or less steady level over the last ten years except for a few slight adjustments deriving more from local custom and marketing requirements rather than from technical or economic factors.

The position of cardboard has been consolidated in the folding box and small and medium capacity container market, especially considering the increasing automation of packaging systems where cardboard packaging responds to the highest machine production rates extremely well, provided that they are suitably manufactured.

8.2.1. Cardboard presentation packages, which may respond to a number of requirements, normally have multicoloured external printing in order to render the package suitable for the requirements outlined in Chapter 2.

8.2.3. The regulations concerning packages likely to be in contact with foodstuffs, mentioned in point 8.1.3., also apply to cardboard packages.

8.3. Installations Specialized in the Production of Paper and Corrugated Cardboard.

The manufacture of finished packaging from cardboard and corrugated cardboard is carried out in factories specialized in the working of these materials, such factories may be of various size and production capacity, there being no fixed rule governing the dimensions of industries of this type. A small mill having few machines and employing a very small number of workers, and qualified technicians may prove highly efficient and economically valuable, although unable to produce the entire range of paper and cardboard packaging, being specialized in a clearly defined series of articles.

A larger installation able to meet the most varied demands of users may be equally viable, subject to the condition that the staff be expertly guided by experienced managers.

8.3.1. Few industries are as dependent upon the effective ability of their machine operators as is the paper working industry. Years of experience and apprenticeship are required to train a

good chief machine operator, and at least ten to fifteen years are required to train technicians capable of undertaking work of a more responsible nature.

Hence, when opening new businesses in developing countries, it is advisable to proceed step by step. Even where the possibility of future expansion of building, communications and infrastructures exists, it is worth the trouble to start up the new works according to a programme of investments, machinery, operating staff, and Management restricted to a first phase confining production to a limited range of articles chosen as a result of a thorough market research survey.

If the programme thus applied is successful, the subsequent growth of the company will develop spontaneously and gradually in consequence.

8.3.2.

It is essential that this type of industry operate in strict collaboration with the final users, considering that frequent contacts between both parties and a regular ordering and working procedure be indispensable.

The production of any type paper or cardboard container may require a considerable number of verifications, revisions, adjustments, size and printing tests which necessitate constant working connections between the paper working factory and the User, as previously stated.

This requirement limits the siting of the paper working factory with respect to the final users to within a radius of no more than 200-300 Km., with the possible exclusion of large capacity users who may be located farther away (400 - 800 Km.), subject to the condition, that the amount of work justify the greater burdens deriving therefrom.

8.3.3.

Apart from the problem of supplies of "basic raw materials" it must be remembered that, if a paper working industry is to function properly, there must be a supply of technical accessories for the job such as printing ink, printing plates, die cutting forms for cutting and grooving folding boxes, glues and sundry accessories.

Such supplies should be undertaken by specialized industries in the sector, which should be sited a reasonable distance away from the paper working installations or similar industries which may require their services.

A second phase of development, which may take place when the new paper working installation has reached a considerable degree of development, involves the opening of a department, inside the works, for the total, or partial production of some of the technical requisites mentioned previously and especially printing plates and die cutter forms.

- 8.3.4. Here is another suggestion concerning the technical equipment for a newly opened paper working factory which takes into account the fact that machinery may be either automatic or semi-automatic.

During the first phase, the machinery for the die cutting of folding boxes and containers may be semi-automatic and not extremely sophisticated, especially considering the supposable output which may be achieved initially, and the start-up times necessary for such machines, which are limited for semi-automatic machines and longer for automatic machines.

8.4. Corrugated Cardboard Boxes.

It is almost a century since the first corrugated cardboard box made its appearance in America, initiating a series of successful applications in all branches of industry, commerce and agriculture.

- 8.4.1. The annual production and consumption of corrugated cardboard throughout the world is astronomical. We may say that this type of packaging has brought about a favourable solution to a series of carrying and storage problems concerning several products and materials, thus making a definite contribution to the development of our modern civilization.

Corrugated cardboard is too vast, complex and important a subject to be discussed in a brief report. It is a subject which, of necessity, requires thorough, detailed expert examination if it is to be presented fully.

- 8.4.2. Here we should point out that corrugated cardboard is used in several agricultural and industrial sectors. This enormous development is due to a series of factors, some of which deserve especial mention.

- 8.4.2.1. The user may achieve considerable economy in packaging by using corrugated cardboard products instead of other methods. We may also mention here that a recent alternative develop-

ment, namely the use of heat shrinkable polyethylene film, has taken its place alongside corrugated cardboard, which it often supplements, or in some cases, even replaces.

8.4.2.2. The functionality and versatility of corrugated cardboard packaging for many purposes.

8.4.2.3. Corrugated cardboard manufacturing technology and the manufacturing methods for the packages made from corrugated cardboard have recently been simplified by the introduction of machines capable of executing a series of working operations more simply than before.

This has contributed to greater expansion of this type of industry also in areas where highly qualified operatives used not to be available.

Finally, this has made possible the creation of small production units, distributed throughout a country in the areas where consumption is greatest, able to work sheets of corrugated cardboard produced by industries equipped with corrugating machines and transforming the resultant corrugated cardboard into the various types of packaging requested by the market. This aspect has also contributed to the capillary expansion of the employment of corrugated cardboard.

#### 8.5. Installations Specialized in the Production of Corrugated Cardboard Packaging.

Corrugated cardboard packaging is produced in factories having suitable machinery, which we may utilize as the starting point of the working of the following raw materials.

8.5.1. Rolls of paper of the various qualities and types required, as described in Chapter 7., for the production of corrugated cardboard which will serve for the production of the finished packages at a later stage.

Such production is realised by means of a special "corrugating" machine which transforms the paper into a continuous web of corrugated board, which is cut into sheets of the size required for further working to produce packaging.

The entire cycle illustrated may take place in a factory equipped with one or more machines for the production of corrugated cardboard, and the other machinery and equipment



required for the subsequent production cycle consisting of the manufacture of various types and models of finished packaging, an integrated process conferring excellent technical and economic results thus being achieved.

This is a type of installation requiring considerable financial investment, and the availability of expert technicians and trained operatives.

The problems afflicting industries involved in the production of packaging from paper and cardboard also affect the production, of corrugated cardboard ( see points 8.3.1., 8.3.2., and 8.3.3. ) and may be solved in a similar way.

The capacity of an industrial complex of the type illustrated may be considered as about 250.000 square metres per day with work spread over three eight hour shifts, which is equivalent to the consumption of 160 tonnes of paper on rolls of the various types and qualities used, or 170.000 finished corrugated cardboard boxes of approximate capacity 0.150 cubic metres per pack.

An investment of the type discussed may necessitate a considerable investment (of the order of 7 million dollars or more), requiring 5 to 10 thoroughly experienced managers, and technicians and 150-200 trained workers, but the number may increase according to the working operations carried out).

A works of this type is able to serve a large number of users easily or, alternatively, to keep a quota of the sheet corrugated cardboard production for other works which are unequipped with a corrugating machine, but have machinery for the transformation of corrugated cardboard into finished packaging.

This possibility introduces the other alternative use for raw materials in the corrugated cardboard sector.

#### 8.5.2.

Sheet corrugated cardboard of the thickness and weight per unit length required produced at specialized factories as described previously, is subsequently sold to other small, specialized production units able to transform it into the different types and styles of packaging required by the users.

Factories of this sort, which are small to medium size, are able to give advantageous service to the user according to their compactness.

The industries which perform the entire production process and which are described in point 8.5.1. are able to transform large quantities of raw materials in a single shift. Production is of a certain consistency and uniformity for economic reasons and the nature of the technical, equipment. This means that it is not economically viable to involve such plants in the production of small packaging lots of 500-1000 items per size since the resultant costs would outstrip profits by a large margin.

On the other hand, final users may also request limited series of corrugated cardboard packaging in relation to their own requirements.

The foregoing points confirm the technical and economic utility of the small to medium production units mentioned and which may be extremely flexible and competitive when working on that basis. It should be mentioned that mills of this sort do not require burdensome financial investments (upwards of 300 thousand dollars ) and necessitate a small number of technicians and operatives (2 - 4 of the former, and 10 - 50 of the latter).

- 8.5.3. The final decision concerning the choice and advisability of setting up new industries in this sector which have one or other of the characteristics discussed may be taken in relation to other factors mentioned in Chapter 6.

The requirements of final users and their total absorption capacity will be particularly decisive.

- 8.5.4. Corrugated cardboard is particularly light and voluminous with respect to weight and consequently haulage over long distances is to be avoided, haulage runs being limited to 50-200 Km. in order to keep costs within acceptable limits. It is worth mentioning that corrugated cardboard boxes may be palletized flat and sent over great distances by land, sea, and occasionally by air. When this occurs, it is certainly owing to special conditions which are not included in this study, being dictated by exceptional circumstances.

- 8.5.5. Furthermore, this confirms the extreme flexibility of this type of packaging which, recently, has been flanked by a new system using polyethylene shrink and stretch film which often supplements, or even replaces, corrugated cardboard, as already mentioned. This will be discussed in the points following.

8.6. Packaging Using Polyethylene Heat Shrink and Stretch Film.

Polyethylene heat shrinkable film for the preparation of packaging appeared on the European market for the first time about the middle of the nineteen sixties. Over ten years have passed since then, and the new method has been consolidated and has entered fields of application that were once the exclusive province of other materials and systems.

8.6.1. What, then, are the causes of this particular changeover?

There are many answers to this question. Firstly, polyethylene heat shrink film involves advantages for industries packing various products who have turned to the new system for general and particular economic reasons, and also for their customers. The cost of polyethylene shrink film per unit weight or unit area is insignificant when considered alone, and is even less when compared to the cost of other packaging materials.

It is necessary to introduce the general concepts of "Global Packaging" given in Chapter 5. if we wish to undertake the comparative examination of the economic validity, of this packaging system compared to other traditional systems.

Heat shrink polyethylene film, therefore, is an authentic alternative to other traditional packaging systems, and especially where the User is concerned.

8.6.2. The areas of application are extremely diversified, starting with the film prepared in the form of a "hood" for the assembly of various goods arranged on pallets, but it also has an extremely valuable function as protection against the elements, such as rain, damp, and dust, permitting the storage of palletized goods in the open air without risk of damage. A saving in covered storage space is thus achieved.

Alternatively, rolls of sheet film may be used to feed automatic modular lines used for various packaging operations. In this case, the symbiosis of materials and modular lines is a practical application of the global packaging concept.

8.6.3. Rather, it is the large wholesale and retail distribution chains such as supermarkets and large scale emporia who have shown appreciation for heatshrinkage film. Products packed with film are wonderfully visible and easily recognized, thus facilitating the opening of packages and shelf arrangement.

The disposal of heat shrink polyethylene film for packaging, which may also be recycled, is extremely rapid, whilst only limited space is required for storage.

8.6.4. Finally, the carriers, who in the beginning had been very dubious about the material, accepted the new method after having noticed that it involved fewer cases of average, since loading staff paid greater attention to the handling of fragile articles.

8.6.5. Polyethylene stretch film is used in the seaming up of palletized loads. In contrast with heat shrinkage film which requires a hot air furnace to apply it, stretch film is applied cold by a special machine with a rotary platform carrying the load to be wrapped. This system is bound to develop considerably in the future, especially when we consider the saving in raw materials and energy obtained when compared with heat shrink polyethylene film.

8.7. Industries Specialized in the Production of Heat Shrink and Stretch Polyethylene film.

A factory equipped for the production of heat shrink and stretch polyethylene film departing from polyethylene pellet, may be of any production capacity, all of which are acceptable.

8.7.1. A production unit equipped with one or two extruders with a daily production capacity of 7 tonnes of film in three eight hour shifts would require investment of the order of 250 thousand dollars and limited manpower (five workers) with one technical supervisor.

8.7.2. An equally technically and economically valid solution would be an installation with ten production extruders having a daily production capacity of 30 tonnes of film over three eight hour shifts. This would require investment capital of about 3 million dollars, more manpower (25-30 workers) and at least 3 - 4 technical supervisor and managers.

8.7.3. Heat shrink and stretch polyethylene film is of high specific weight and consequently transport costs from the production point to the user point do not have an excessively adverse effect on the final selling price. Consequently, a factory of this sort may serve much wider areas, even from 1.000 - 1.500 Km. away, depending on the number of Users.

9. PACKAGING PROBLEMS CONCERNING SOME SECTIONS OF AGRICULTURE AND INDUSTRY.

A series of problems concerning basic raw material production for determinate types of packaging and the most important aspects inherent in the manufacture of packaging destined for the final user have been discussed in previous chapters.

9.1. Industries under Consideration.

The practical applications of packaging in some industries including agriculture, listed below, will be discussed in this chapter viz:

- 9.2. Mechanical, electrical and electronic engineering Industries. Machine tools and hand tools.
- 9.3. Light industries. Textiles, leather, hides, and other consumer goods.
- 9.4. Cement and building materials.
- 9.5. Pharmaceutical and Medicinal Products.
- 9.6. Chemicals and fertilizers.
- 9.7. Agriculture, fisheries, and food.

Each subject will be outlined briefly, if only because they are so vast as to require entire book devoted to each to deal with them in any detail. As we have already said, the aim of this study is to point out the possible applications of the various types of packaging discussed in the industries listed above to form a basis for further study and broader discussion.

9.2. Mechanical, Electrical and Electronic Engineering Industries, Machine Tools and Hand Tools.

Industries of this nature are able to utilise the following:

- 9.2.1. Small to medium size cardboard or corrugated cardboard packaging for electrical parts, motors, various apparatus, tools and accessories which normally have been previously packed with other materials (laminates, treated paper, heat shrink polyethylene film, metal or plastic boxes, etc) in order to protect them from external agents.

The packages may contain from a few hundred grammes to ten - fifteen kilogrammes of goods, and normally will be grouped onto pallets to form loading units for storage and successive forwarding.

The electronic instruments industry uses an integrated packaging system, rather than a single type of packaging, into which the materials, often of an extremely elaborate and sophisticated nature, are collected. The various components of the system are complementary and supplementary to one another so that they may give the widest possible protection against external factors likely to cause damage under all anticipated conditions and for the time required.

These industries may also utilize:

9.2.2. Heat shrink polyethylene hoods for wrapping, locking and protecting the individual cases stacked on the pallets.

9.2.3. It should be mentioned that, except for special operations carried out on small device production lines where an automatic packaging system is connected to the line itself, such operations are semi-automatic or manual.

The bigger and more complex the machine or apparatus to be packed, the greater the precautions and care to be taken, packaging to be effected exclusively by specially trained packers.

9.3. Light Industries, Textiles, Leather, Hides, and Other Consumer Goods.

In contrast with the industries mentioned in point 9.2., these may be equipped with automatic packaging lines.

All types of cardboard and corrugated cardboard packaging, whether for presentation of for shipping, are widely used in these industries, as is also heat shrink polyethylene film.

The number of case types involved is extremely varied, but we may state that each specific problem connected with them has long since been resolved efficiently.

The packaging used in these industries would appear to have no special function other than that traditionally required of a good container produced according to the best practice from suitable raw materials.

9.4.

Cement and Building Materials.

Cement packaging problems have long since been solved through the use of valve type bags produced using several layers of Kraftliner, some of which are laminated with another barrier material to impede damp penetration and increase strength.

This method has remained unchanged over the years except for small variations in the quality and thickness of the Kraftliner used.

In connection with building materials, we should also mention the use of special corrugated cardboard boxes to contain ceramic tiles for finishing kitchens, bathrooms, or similar rooms, and other tiles used for flooring.

Since this is an extremely delicate and fragile material, the tiles are packed in vertical form in two parallel rows inside special corrugated cardboard boxes able to contain a total weight of approximately ten kilogrammes and expressly designed to protect them against shock and abrasion.

Sacks of cement and corrugated cardboard boxes of tiles are normally palletized for storage in order to constitute loading units.

In both cases, loading units are suitably assembled and protected by means of heat shrink polyethylene hoods, which, when heated, shrink tightly around the load thus making it stiff and compact.

The treatment indicated permits the open air storage of the load units for considerable periods, fully exposed to the elements, without the contents being damaged in any way.

Heat shrink polyethylene hoods are in widespread use for wrapping loads of bricks, roofing tiles, and similar materials which may be dispatched to any locality thus wrapped.

When heat shrink polyethylene hoods are to be exposed in the open air for long periods and consequently exposed to the direct rays of the sun, ultraviolet absorbers should be added to the film during manufacturing so that the film may retain its mechanical characteristics for the entire period established.

9.5. Medicinal and Pharmaceutical Products.

Industries in this sector use enormous quantities of boxes and packaging of all types and qualities, and especially of paper, cardboard, corrugated cardboard, and polyethylene film.

Some points which may be considered as being common to all these industries with regard to each type of packaging used should be especially emphasized.

9.5.1. The packaging materials used must be manufactured so that they conform to the rules and regulations governing the health and hygiene problem of product and container compatibility in force in each country.

9.5.2. The industries operating in this field are normally equipped with automatic or semi-automatic packaging lines. This conditions the quality of the materials used - i.e. paper and cardboard, packets, containers and boxes of cardboard and corrugated cardboard, and corrugated cardboard packaging.

It is essential that the packages and packets used be manufactured in conformance to stringent quality standards in order to obviate halting of the packing lines caused by the raw material employed which may be subject to size changes owing to climatic variations in some cases, or manufactures for which the tolerance limits imposed have not been observed. Both may cause interruption of production and damage to the firm.

9.6. Chemicals and Fertilizers.

The packaging problems concerning this industry may be considered under the same general profile as "cement" in point 9.4.

Many chemicals and fertilizers are packed in oversize paper bags similar to cement, except that here there is an ever increasing tendency to adopt plastic instead of paper.

Palletization methods using heat shrink polyethylene hoods to protect and secure the load are widespread.

Other chemicals and fertilizers destined for sale to the general public through retail shops and supermarkets are often packed in cardboard, or corrugated cardboard boxes containing amounts varying from a few hundred grammes to one or two kilogrammes.



The cardboard used to manufacture these packages, and also the packages themselves, must be carefully chosen, designed, and produced through the application of the hints given in points 3.1.1. et seq.

We might also add that packages which are to contain chemicals and fertilizers must be produced so that the products they contain cannot contaminate the outside since they may even be poisonous.

Packaging of this sort should be supplied with lettering giving details of any hazards, instructions for use, and any suggestions for precautions to be taken during storage.

9.7.

Agriculture, Fisheries and Food.

The industries operating in this field are the greatest users of all types and qualities of packaging. We have already mentioned, in Chapter 2., the decisive rôle played by supermarkets in this tendency to pack food products on sale to the general public on a large scale.

Paper, cardboard and heat shrink and cold stretch films play a pre-eminent part whilst the points raised in previous paragraphs concerning the quality of the raw materials used in relation to the machining capabilities of automatic packing lines are equally valid.

We could devote a special, detailed investigation to the treatment and packaging of agricultural products for deep freezing if there were sufficient space available.

This system enables us to harvest all types of fruit and vegetables at the proper time and work them locally in factories located on the spot. After they are harvested, these market garden products are conveyed to the factories where they are suitably washed, selected, cleaned, cooked if necessary, weighed, and packed in special cardboard boxes treated against damp, or in polyethylene bags.

When these operations have been completed, the goods are deep frozen at a temperature of minus forty degrees Celsius and the product thus obtained will be conveyed, and stored, also for long periods, by cold line which will persist right to the time and place of consumption.

Also in this vast marketing sector, the possible lines of application of many types and qualities of packaging can not be easily condensed into a study which, like this, must essentially be brief. It should be pointed out that each product - or nearly each product - requires its own solution; one type of material, and a given packing machine, which is often built on request to the packaging company's own requirements.

For the reasons given above, it will be necessary to make the proposals made in Chapter 10. following applicable as soon as possible in order to bring a programme of co-operation between industrialized and developing countries into operation.

Adequate working and packaging of agriculture, fisheries and food products using the most suitable materials and systems, linked with modern stocking, storage and refrigeration methods where required, palletization, loading, and unloading, all means of conveyance, etc, is the essential key to the prevention and obviating of the loss of vast quantities of agriculture, fisheries, and food products in future, as still happens all too frequently today.

It is the key to the undermining of that sad calamity, famine which still occurs cyclically today, afflicting helpless defenceless populations. Famines of this sort are often the consequence of inadequate packaging, storage and conservation methods.

10.

FINAL CONCLUSION AND OPERATING SUGGESTIONS.

During this study, we have illustrated a few general and particular problems concerning packaging, even if in a simplified form. We have been shown that, on the basis of experience and applications brought about over the years by many industries operating in the industry, located for the most part in economically advanced nations, these problems have been successfully solved.

We now have to transfer the experience, technology, and manufacturing methods which have been acquired by those industries, the practical teaching, staff training schemes, the hints concerning the most suitable machinery and other information to Companies in the industry which already are engaged or will be engaged, in similar activities in developing countries.

In other words, it is essential that we proceed soundly to the realization of a vast programme for international co-operation having as its final objective the creation and starting up of new industries or the modernization of existing ones able to propose systems of similar efficiency to those existing and operating in industrialized countries.

In order to obtain such results, a series of programmes should be drawn up which, following careful examination, may be gradually applied. One of these programmes might be developed on the basis of the outline given below:

10.1.

The Rôle played on a World Scale by National Packaging Centres or Institutes.

Here, we should point out that these organizations operate throughout the world, and especially in Europe, the USA, Canada, Japan, Asia, Latin America and that many were founded at the beginning of the nineteen fifties and have considerable experience and traditions, whilst others have been formed more recently.

In each country where they are active, they unite the packaging producing industries (machinery, raw materials, and finished packaging), the packaging utilizer industries and in many cases, also the technologists and experts in the industry.

Some recommended procedures for the manufacture and utilization in the best way possible of raw materials and finished packaging have been discussed on a technical and economic basis in previous chapters. The application of these procedures essentially requires the availability of staff of various degrees of qualification able to evaluate the different problems as they arise, in order to be able to take the final decisions in a responsible manner.

Packaging is, on the whole, a special technique which may be acquired - and not completely - after several years of study and practical experience in industry and research laboratories.

It should be remembered that save for a few exceptions, no special training schools where it is possible to study and improve one's knowledge of these methods exist. Therefore, we should follow other routes having the aim of qualifying the staff involved specifically.

10.1.1.

Among its most important responsibilities, a National Packaging Centre or Institute operating in its own country has the task of favouring preliminary training suitable for those beginning work at a certain level in the packaging industry with industries producing or utilizing packaging (machinery, raw materials and finished products).

This obviously means the preliminary training of technologists who will be employed by Companies producing raw materials or finished packaging, where knowledge of the general problems facing the industry may be of considerable use in the carrying out of particular activities which will be even more appreciated by technologists employed by special offices of the industries using finished packaging and whose activity is devoted to that industry.

However, the term "preliminary training" does not include the training of staff to use and understand the functioning of machinery producing or using packaging inasmuch as this task is not contemplated for by the prerogatives and aims of these courses.

We may state that each National Packaging Centre or Institute should constitute a reference and driving force for the study of the different sections of the great packaging industry having a specific medium to long term programme to be carried out

seriously in their respective countries; this if the subject is to obtain the best technical, scientific and economic solutions possible.

10.1.2. The National Packaging Centres or Institutes operating throughout the world may be organised on different bases:

Private Associations, created and financed by the industries producing or utilizing packaging (machinery, raw materials, and finished products), with the possibility of the co-operation of technologists and experts on a personal basis as Associates.

The private Associations, as indicated above but aided, even partially by state contributions from ministries, public bodies, and other state organisations directly or indirectly interested in packaging problems.

An Institute totally financed by the state.

The three solutions mentioned previously may be equally valid depending on the conditions existing in each country, subject to the condition that the National Packaging Centre or Institute have sufficient funds, even if they are limited, which allow them to undertake a minimum of activity, employ the necessary staff, and that it be autonomous both technically and scientifically, that it be independent of all industries or sectors of industries with special reference to the different materials and systems.

These are unforegoable conditionals if the absolute neutrality and equidistance from Associates, industries, and persons, producers, and utilizers, large, medium and small companies, and toward different materials, systems, and machinery existing on the market are to be ensured.

Personnel requirements: in the first instance a Manager or General Secretary is required; this person will be young or middle aged, an excellent organizer, have a good knowledge of foreign languages, be ready to travel extensively, ideally an expert in industrial problems but not necessarily those concerned with packaging; he will be capable of studying and learning within a very short period (six months to one year) rudiments of technology, that are the base of modern packaging, in the general context of the materials and systems that are currently most commonly applied or to be applied in the future.

The Manager or General Secretary - whose activity will be directed by a President of Board designated by the members according to the Articles of Association in force - will be the focal point for all future activities, and will be the responsible for organizing the Institute or Centre as a body at the service of those national Companies concerned with the development of their packaging programmes.

In the beginning, this person will be aided by a few assistants - from two to five - while waiting for development of activities and the engagement of other staff.

Obviously, the Institute or Centre needs an office, though unpretentious, to be used as a base for the organization which, during the initial activity, could adopt the following policy:

- 10.2. Scheduling of the Activity of a National Packaging Institute or Centre.
- 10.2.1. Admission of Members on the basis of the various categories provided for by the Articles of Association; the Members shall pay their admission fees and annual subscription, thereby contributing to the financing of scheduled activities.
- 10.2.2. Formation of a library where the books on packaging published in different languages, and the most important technical magazines on this subject published at home or abroad will be collected.
- 10.2.3. The Institute or Centre will review all these books and publications as soon as they are received, and compile a bibliography to be distributed to the members at regular intervals, possibly once a month. A useful example of the best system of developing this activity may be the periodic bulletins issued by the European Packaging Institutes.
- 10.2.4. Contact with members to advise them - normally against payment - on the solution of various problems. During the initial phase, the Institute or Centre may resort, mainly for highly specialized subjects, to foreign consultants who are expert in the various fields, and to the assistance of one or more European Packaging Institutes according to a programme of co-operation carried out with the assistance of UNIDO which will be proposed at the end of this study.

10.2.5. Structuring of an annual packaging course - mainly concerning users - with a view to tackling general subjects while waiting for the organization of seminars of debates on specific subjects. The assistance of UNIDO and the European Institutes which have vast experience in this field may prove to be an excellent grounding for the laying of the foundations for the solution to this problem as well.

The organization of a general packaging course, under the auspices of a European Institute, based on audio - visual aids, and intended for a group of Countries with a common language may be of interest in this respect.

10.2.6. The issuing of a monthly or bimonthly publication or, if possible a technical magazine concerning every aspect of packaging and containing technical, economic and commercial articles, news, information, home and international events. This publication will be the official organ of the Institute or Centre, where the proceeds from publicity may be the only means of financing.

10.2.7. Formation of a data bank for the collection and listing of the numerous data on packaging, divided according to raw materials, applications, machines, etc. This information will be an efficient aid to the companies which will receive - upon payment and as soon as the necessity arises - a set of updated news and details on specific subjects.

10.2.8. Organization of national exhibition and trade fairs. Joint participation in identical events in foreign countries. Organization of congresses, studies, technical visits devoted to specific subjects.

10.2.9. Organization of study and work groups formed by the representatives of package producers and users, and by other technicians and experts not necessarily belonging to industries, whose activity is directed toward specific subjects such as:

- Standardization of the different materials, packages, packaging and transport systems, test and inspection methods, at a national level but with strict and constant reference to the international standards in force or being developed; participation in identical international commissions.

- Collection and processing of data and statistics concerning raw materials and finished packages of different quality, home and abroad, expressing medium and long-range trends and forecasts.
- Protection of the natural environment in connection with packages, especially referring to man's upbringing since man is the final user of the various disposable containers and is often responsible for spoiling the countryside; studies and researches to investigate the efficiency and convenience of disposable and reusable packages, in connection with the basic subject; organization of education campaigns; contacts with Government authorities in relation to the specific subject; studies on the possibility on collection and recycling of old packages with a view to economizing on raw materials and energy.
- Quality control of raw materials and finished packages.
- Laws on packages with particular reference to the materials that will come in contact with foodstuffs; conformity of national packages with the rules of foreign Countries, mainly for goods to be exported; study of compulsory labels and letterings required by importing countries.

These are some of the most important points which should be gradually imposed and developed by every National Packaging Institute or Centre operating in a developing country.

Another fundamental aspect of the packaging industry concerns study, research and testing laboratories. This problem will be discussed briefly in the following paragraph.

10.3. Laboratories for Studies, Research and Tests on Raw Materials and Finished Packages.

Study, research and testing laboratories are an extremely important facet of packaging.

These laboratories are needed to:

- 10.3.1. Conduct research into the future of packaging.
- 10.3.2. Study the behaviour of the finished packages and materials available on the market, drawing up technical specifications and quality standards.



- 10.3.3. Study new materials to be used as alternatives to or replacements for the existing ones which be technically or economically obsolete.
- 10.3.4. Check the manufacturing standards, with reference to scheduled provisions or specifications.
- 10.3.5. Check the compatibility or incompatibility of certain materials and packages with foodstuffs.
- 10.3.6. Check the degree of deterioration of packages manufactured from certain raw materials or materials, when exposed to atmospheric agents, light, or special duties, in relation to special geographical areas.
- 10.3.7. Check the behaviour of other materials or systems which form the package: inks, stapling, sealing, gluing of the various components, etc.
- 10.3.8. Conduct comparative strength and endurance tests on shipping packages by simulating by means of special equipment, the different climates and stresses effecting packages during conveyance by land, sea and air or any possible combination. This is also to find the points of least resistance in relation to the product contained and to its global protection with special reference to the problems arising from export.
- 10.3.9. Conduct other microbiological tests on the various raw materials or substances used or likely to be used, and which will be requested by producers or users.
- 10.3.10. To publish periodically reports on the studies and research carried out.
- 10.3.11. Collect and list any information concerning the study and research activities of similar foreign laboratories.
- 10.3.12. The creation of such a laboratory, capable of conducting activities as previously mentioned, involves considerable building investment, to provide the laboratory with the necessary structures, including a series of air-conditioned rooms, and the required equipment and machinery.

This will be supplemented by an annual grant to be related to the amount of work the laboratory intends to carry out, to cover running costs, wages, services, power, supplies, etc.

The administration of a packaging laboratory - taken as an autonomous body and excepting few cases - has always been run at a loss even when the tests have been charged to the customers. In other words, current expenses considerably exceed income, and consequently such a laboratory cannot be financially self-sufficient.

On the basis of this experience it is inadvisable for each package Institute or Centre to organize its own study, research and test laboratory exclusively for reasons of "prestige"; unless these Centres or Institutes are totally financed by the State, in which case the laboratory also falls within the activities financed from public funds.

Another factor of first magnitude which must not be neglected, is the difficulty encountered in simultaneously engaging of a certain number of qualified technicians capable of managing these laboratories when each Institute or Centre decides to establish its own facilities.

There is also the difficulty of the engagement of subordinate technicians to work in the laboratory, calculating a staff initially consisting of a Manager with an Engineering or Chemistry degree, two graduates in Biology or Natural Sciences, some line employees and three workmen.

It should be kept in mind that both the Manager and the graduates will improve and supplement their basic knowledge through experience in the field of packaging, carrying out their training with foreign industries and laboratories concerned with packaging for a period varying from six to ten months.

This first group will be the basis for a subsequent development of the entire programme when the staff will be gradually increased to a hundred or so members many of whom will specialize in highly sophisticated studies and research while others will be working with new laboratories which are being organized.

The creation of different packaging laboratories capable of conducting tests and research into every field and material is not advisable. This would require much specialized equipment and the engagement of highly qualified staff thus creating difficulties. Moreover, the extent of the work and the great differentiation required would prejudice the quality of the product.

10.3.13. These may be valid solutions:

10.3.13.1. The founding of a first central laboratory for testing and research into packaging, founded and financed by a group of Institutes, possibly financed and technically aided by UNIDO and industries in this field belonging to one or more Countries where they operate.

This laboratory, serving several institutes, will be located in a geographic area with suitable characteristics, easily accessible to the institutes of the group, to the industries with major interest and also to the European laboratories with which, in the context of the UNIDO programme, a programme of mutual co-operation and assistance should be scheduled. Subsequently, on the basis of the experience acquired, a similar or identical second laboratory will be set up in another region.

10.3.13.2. The creation of specialized laboratories concerned with only one aspect of packaging: paper or cardboard, glass, ferrous or non-ferrous metals, plastic materials, wood etc. Granted that the manufacturers of specific raw materials, substances and ready-to-use packages produced with certain materials are particularly interested in studying and knowing the final behaviour of the products placed on the market in order that they might make modifications or improvements, or suggest new applications, although located in several adjacent countries, they should set up and finance a laboratory, specialized in only one field, to serve different Institutes and final users.

The geographic location will be chosen by the industries concerned. The financing and operation of this laboratory will be totally borne by the various industries operating in that specific field, without the intervention of Institutes, Government bodies; and UNIDO can co-operate in this programme on an organization basis, aided by the European Institutes and laboratories.

10.4. A Plan of Action.

Developing countries are unable to face and solve packaging problems as quickly as the emergent situation requires. Hence, it is the duty, and the obligation of industrialized countries to take action and begin the solution of these problems and furnish any aid and assistance which may be required.

This is a duty stemming from the sense of brotherhood men of wealthier nations should feel toward those in less fortunate circumstances, unendowed with extensive natural resources, means, and living conditions.

Since packaging also implies, among other things, adequate protection of foodstuffs against loss, rodents, mildew, damp, and deterioration, the adequate packing of foodstuffs implies a step toward defeating hunger in many developing countries. In other words, it implies the saving of human life.

Now, what might we call a valid plan of action ?  
What short term enterprizes should be undertaken ?

10.4.1.

One of the proposals of action could be developed as follows:

Firstly, those National Packaging Institutes or Centres having the necessary qualifications, availability and the desire to undertake the paid responsibility of consultancy in the form, manner and times which might be established and agreed should be chosen and selected. The responsibilities would be undertaken under the control and co-ordination of the UNIDO or other delegate body, and directed toward several developing countries with the aim of drawing up, developing and the final development of one or more applicative programmes in the packaging industry.

Should this line of action be accepted, it would be advisable for each chosen Institute to undertake a specific task for a given technical development to be processed and applied in one or more developing nations having economic, market, or territorial affinity.

Assuming that this starting point is valid, it would be possible to develop an extended programme of technical co-operation through each Institute concerned with the enterprize programme developed between Bodies, Organizations, and industries existing in developing countries tied to such action.

If there were an operative National Packaging Institute, albeit on a reduced scale, in the developing country or in several neighboring countries having similar problems involved in this action, the latter would be eased considerably and time of materialization of the entire programme would be greatly reduced.

10.4.2.

When we enter into the details of the suggested procedure, we may easily predict the highly favourable results which may be obtained over a short period. The industries in industrialized countries interested in this programme will be able to offer valid support to new and similar industries activated, or to be activated in developing countries, to which they will be able to supply new, valid technical aid at all levels but especially the opportunity to train technicians and operatives who are to work in the new plants.

A considerable number of industries and people called by each Institute responsible for its own particular project and interested in giving their collaboration and technical assistance in view of the possible supply of plants, machinery, equipment, basic raw materials, manufacturing licenses, know-how, etc. will be set in motion by operating on these lines.

An action such as this might well break the technological isolation still existing in many developing countries in comparison with industrialized countries which conditions and heavily delays the various initiatives as they are begun.

10.4.3.

The action indicated is of a technical nature but it would be better classified as political inasmuch as special intervention on the part of the states involved would be required for the beginning of the development and the entire action would have to be guided and co-ordinated by the United Nations (UNIDO) within the field of world-wide technical and scientific co-operation.

10.5.

The Financing of the Operation Illustrated.

A programme like the one illustrated requires considerable financial investment which may be obtained by utilization of the special funds that industrialized nations contribute annually to the United Nations special fund for the promotion of initiatives in favour of developing countries.

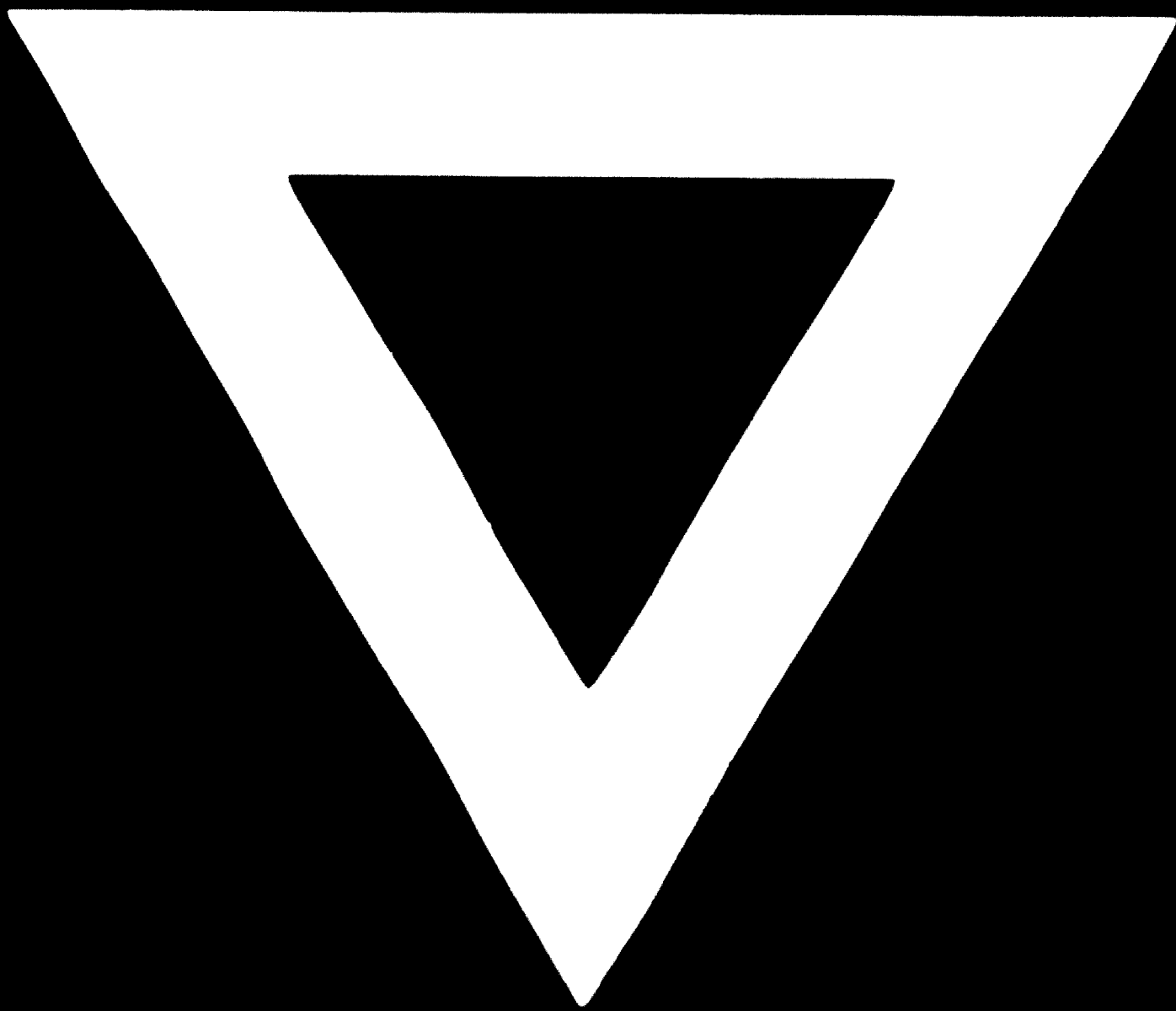
These funds often remain deposited in the banks for long periods for want of use.

These funds could therefore be used, even partially, in favour of industrialized nations having the right to finance their respective packaging Institutes if involved in a programme of the type illustrated here.

It is merely a matter of passing from words to action.



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