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REINFORCEMENT OF THE PACKAGING TECHNOLOGY DEVELOPMENT CENTRE IN HO CHI MINH CITY
DP/VIE/86/046
THE SOCIALIST REPUBLIC OF VIET NAM

Technical report: Support to the Packaging Technology Development Centre in flexible packaging technology and structural design*

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

Based on the work of G. Tracy,
expert in consumer packaging design

Backstopping officer: J. Belo, Engineering Industries Branch

United Nations Industrial Development Organization
Vienna

* This document has not been edited.

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SUMMARY

I. Objectives

Establish a Packaging Technology Development Centre (PTDC) at the SAIGON PACKAGING EXPORT COMPANY (SPACEX) in Ho Chi Minh City (HCMC) to cover the country's packaging industry development needs, mainly flexible structure for foods.

II. Duration

Six weeks at duty station (HCMC) Viet Nam during which time the expert assessed the current level of Flexible Packaging Technology through Food Production & Packaging Factory visits, trained PTDC staff, and prepared this report.

III. Conclusion

A. The PTDC is currently adequately staffed, but lacks some testing equipment for developing and evaluating the locally fabricated finished packaging flexible structure.

B. The PTDC lacks some equipment necessary to effectively develop, test and evaluate all packaging materials.

C. The food processor and packaging companies lack the proper materials and equipment to cost-effectively distribute their products to international standards.

IV. Recommendations

A. Purchase additional test equipment necessary to cost-optimize all packaging materials being used.

B. A three-year programme for training PTDC's technical staff should be developed, and PTDC staff should then teach courses at the Polytechnic University to prepare students for packaging careers.

C. Incentive should be provided to food packaging companies to eliminate staples and use adhesives or tapes mainly for closing cartons and corrugated board boxes.

D. The PTDC should compile and publish a directory of all packaging material conversion operations in Viet Nam.

E. The PTDC should publish its Technical Journal on a quarterly basis.

F. UNIDO should support PTDC's efforts to obtain assistance in transport packaging and the services of an expert to train staff and local industry in the design, fabrication and use of corrugated containers because transport packaging effects quality of plastic pouch packs and needs improvements for export packaging.

INTRODUCTION

The Packaging Technology Development Centre began operation under the direction of the Saigon Packaging Export Company during 1990. They requested that UNIDO provide an Expert on Flexible Packaging Technology and assist in building the institution, mainly in the area of flexible packaging technology.

This report was prepared by Mr. Gerry Tracy as a result of this mission (see Job Description - Annex 1).

The activity began in the USA on 21 February 1992 upon confirmation by UNIDO of the assignment in order to gather a library of technical data that is unavailable in Viet Nam. This activity continued until departure from the US on 13 March 1992. Work at the duty station in Ho Chi Minh City began on arrival on 17 March 1992 and concluded on departure on 30 April 1992.

OBJECTIVE AND REVISIONS

The original objectives as listed in the job description (Annex 1) were revised due to inadequate time at the duty station to complete the duties as follows:

1. A brief survey of consumer flexible packaging for foods found no significant deficiencies in physical and chemical properties of films for domestic consumption within the constraints of available materials and methods. As higher technology materials and equipment may become available and affordable, this duty was amended to include raising the technology level to international standards with the possibility that Viet Nam could export more value-added products of higher export dollar value rather than low value bulk commodities.

2. A typical package that offers potential for improvement was identified, (metal can for baby milk powder) and alternate designs were proposed in flexible packs that should reduce total packaging costs when fully developed. Due to a lack of the proper materials and suitable lab equipment, a physical prototype could not be developed at the time, and plans were made for the PTDC to complete this activity.

3. A major portion of the expert's time was devoted to training the counterpart staff in the technical aspects of flexible structures, preparing and presenting two seminars.

4. A programme was developed for the counterpart to implement over the next six months, including:

a. Development of the prototype materials and processes proposed for baby milk powder in flexible packs.

b. Improvement of the PTDC technical knowledge with needed equipment for package testing and development.

ACTIVITIES

1. Initial Survey and Assessment

At the beginning of this mission, the expert found that the package development function and processes to achieve acceptable packaging suitable to the developed countries was little understood and not practiced by the domestic packaging and food industries. Many obstacles were encountered to effectively complete the mission as planned, such as inadequate and erratic electrical power supply, unavailability of materials and antiquated machinery.

The expert found a significant lack in state-of-the-art manufacture and use of corrugated containers.

2. Deviations from the Job Description

Deviations from the job description (Annex 1) were necessary in order to raise the basic technology, practices and systems of package development for the counterparts (Annex 2) to the levels that are acceptable to the developed countries. Most of the time the expert spent in preparing and presenting two seminars with the assistance of Mr. Ha and Ms. Tien to raise the understanding of both the package supply company (SPACEX) and its customers.

A programme was suggested to develop prototype flexible packages to replace the expensive metal cans being used for baby milk powder over the next six months.

Package testing equipment of the PTDC was found inadequate for primary, secondary and tertiary package testing and development, and recommendations were made for improved service to client food companies.

CONCLUSIONS

A. The PTDC is adequately staffed with educated people having an eagerness to learn more of the technology of packaging.

B. The PTDC lacks some equipment to effectively develop, test and evaluate all materials used in primary, secondary and tertiary packaging. Some of the equipment has been ordered, not yet installed and technicians are untrained.

C. The food processors and packaging companies lack equipment and materials to cost effectively distribute their products to international standards. Metal staples are used to combine flexible pouches and to seal paperboard cartons and corrugated containers which rust quickly in tropical conditions, and damage the strength of the paper materials they are intended to seal.

RECOMMENDATIONS

A. Purchase this additional equipment for the PTDC laboratory so that they can be trained in its use and be able to better serve their clients to develop, test and evaluate primary, secondary and teritary packaging:

I. Film heat sealer with variable design of heat sealing jaws and control of time, temperature and pressure variables.

II. Vibration table to simulate the hazards to plastic film packaging in finished cases while transporting from food factory to the consumer.

III. Drop tester to simulate the hazards encountered in manual handling of cased foods.

B. Funding for the training of the PTDC staff should be increased over the next three years to improve their technical knowledge of all types of packaging materials and systems.

When the staff feels adequately trained, they should teach a course in the Packaging Technology Section of the Food Chemistry Department of the Polytechnic University in Ho Chi Minh City to prepare college students for careers in this field.

C. Food packaging companies should be provided with incentives to discontinue the use of metal staples wherever they are used because they are unacceptable for receipt by their international customers. Alternate systems of cold and hot melt glue applications should be investigated as replacements for staples.

D. The PTDC could compile and publish a directory of all packaging material converters, both merchants and captive operations, to improve the development and exchange of domestic technology and reduce imports, and better serve their clients.

E. The PTDC could publish their technical journal "PACKAGING VIET NAM" on a quarterly basis, rather than semi-annually to raise the technology level of the packaging companies and their clients.

F. Funding should be increased for training staff and local industry in the design fabrication and use of corrugated containers for domestic and export markets, specifically:

I. Improve manufacturing processes of local converters of liners and corrugated medium and manufacturing processes into containers, to eliminate stapling operations, reduce costs and improve structures.

II. Correct the deficiencies in methods of packing corrugated cases, introduce correct sizing techniques, taping systems, hot melt and cold glue systems technologies to correct these deficiencies and train staffs.

Annex 1

24.7.1991

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

PROJECT IN THE SOCIALIST REPUBLIC OF VIETNAM

JOB DESCRIPTION
DP/VIE/86/046/11-05/J-13320

Title : Expert in consumer packaging design

Duration : Two months

Date required : As soon as possible

Duty station : Ho Chi Minh City, with possible travel within country

Purpose of project: The project has a single, institution-building immediate objective which is to establish a Packaging Technology Development Centre at the Saigon Packaging Export company in Ho Chi Minh City to cover the country's packaging industry's development needs mainly in the field of flexible (plastic-based) packaging technology, regarding:

(a) package development, design and material/process specifications;

(b) process development, production engineering and technical support to industry for both, packaging materials and package production;

(c) package and packaging materials testing and quality control support to industry;

(d) preparation of packaging standards

(e) disseminating packaging-related information to packaging materials and package producers and users.

Applications and communications regarding this Job Description should be sent to :

Project Personnel Recruitment Section, Industrial Operations Division, UNIDO, VIENNE, INTERNATIONAL CENTRE, P.O. BOX 300, VIENNE, AUSTRIA.

Duties

The expert will be assigned to the Packaging Technology Development Centre (PTDC) which has been set up by the Saigon Packaging Export Company, SPACEX, in terms of premises, operations and management responsibility. He will work in co-ordination with the Chief technical Adviser (CTA) of the project and close co-operation with national counterparts designated for this mission.

The expert will specifically be expected to:

1. Carry out brief survey of the consumer packaging to study the deficiencies in terms of overall design of the package.

2. Select a typical package which offers potential for improvement, and develop alternative designs - with reference to material, shape, structure, closure, etc. to overcome the observed deficiencies and produce a prototype.

3. Train the counterpart staff in the approach to design packages in flexible material - both theoretical and practical.

4. Develop a programme for the counterpart to implement, over a six month period, following the period of visit, in the area of improved functional design of consumer packaging.

The expert will also be expected to prepare a final report, setting out the findings of his mission and his recommendations to the Government on further action which might be taken.

Qualifications

University graduate in science/technology/ engineering 10 to 15 years relevant experience in the functional design/development of packaging especially in the field of consumer packaging.

Language

Proficiency in English

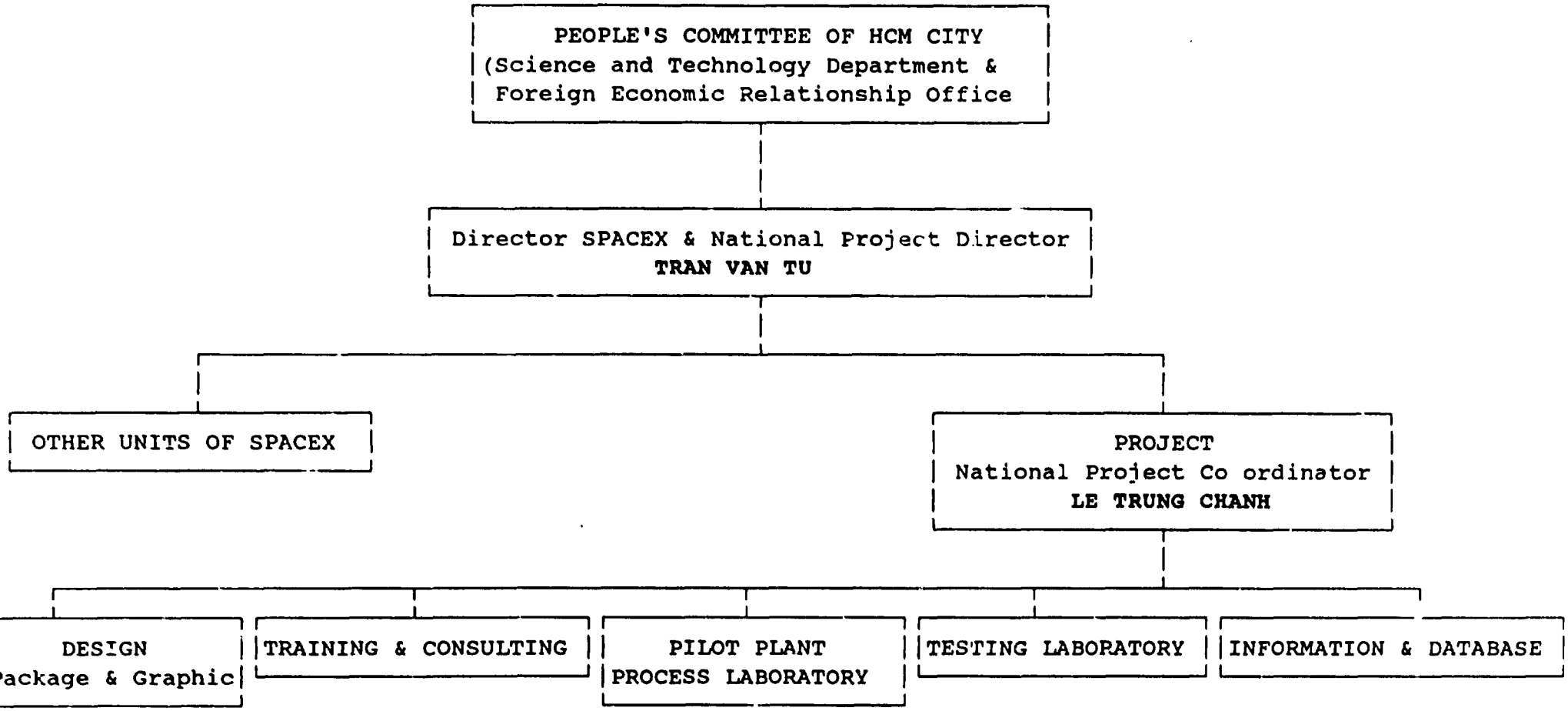
Background Information

Flexible plastic packaging is predominantly used by the food processing industries for products such as: dried fruits and nuts, dried fish and marine product, frozen foods in general and processed marine products in particular. All the products are of primary relevance to Vietnam, since exported fish and marine products are the largest foreign currency earners of the country and having the greatest potential for export growth, up to an estimate $1 billion dollars per year. It is therefore imperative for the country's industry to package imperative for the country's industry to package its export products according to work standards, since the quality and appearance of the package reflects on price.

The present situation in Vietnam, as regards packaging technology, is problematic. The major problems relate to technology; metal cans are of poor quality; corrugated and paper cartons are not strong enough to withstand abuse in shipping, particularly when exported, requiring wooden crating which add cost; wooden pallet and crates are "over constructed" and costly; etc. A basis problem of the industry is that there is no institutional dealing exclusively with packaging, as in many other developing and all the industrialized countries, to help resolve such technical problems. This is particularly true for flexible, plastics-based packaging, which play a critical role in the country's export drive. This is the issue the project primarily is concerned with, although packaging problems in general will also be addressed (i.e package testing, standardization, dissemination of information).

PACKAGING TECHNOLOGY DEVELOPMENT CENTRE

ORGANISATION CHART



NGUYEN THI MY LIEN	LE THANH HA	NGUYEN THI HONG PHUONG	NGUYEN THI HONG DUNG	NGUYEN THAI PHUONG
BUI BICH HANG		HUYNH TRUNG HIEU	BUI NGOC TIEN	
DINH BINH DINH		HUYNH THAI HIEP	(NGUYEN THIEN TAN)	

REPORTS OF VISITS TO INDUSTRY

REPORT OF VISIT

Date : 25/3/92

Place : SPACEX FACTORY
Address : NEAR THE PTDC, DISTRICT 11, HCMC
Reporter: GERRY TRACY

Factory was not in operation due to a power outage at the time of the visit. Only manual operations with garbage bags for Taiwan were being counted, stacked, banded and packed in woven sacks.

EQUIPMENT INCLUDED

A. FILM PRODUCTION

QUANTITY	DESCRIPTION
1	Large Eaton blown film extruder
2	Medium Eaton blown film extruders
1	Small Vietnamese blown extruder
2	Film flexo printers with corona treaters of Australian make
1	Twin film extruder for blown film
4	Bag makers

B. CORRUGATED PRODUCTION

QUANTITY	DESCRIPTION
1	Taiwanese 2 color flexo printer
2	Taiwanese stack feed slotter/creasers
1	Vietnamese corrugator for B or C flute
1	Vietnamese one color flexo printer
1	Wax surface curtain coater
2	Hand stitchers for stapling case side seams

REPORT OF VISIT

Date: 27 March 1992

Contact : VU MANH HAI,
Director
Company : Xi Nghiep Banh Keo VINABICO
Address : 436 No Trang Long P/3
Binh Thanh district,
Ho Chi Minh City
Telephone: 45584-46537

Problems as outlined by Mr. Hai of VINABICO are that the Vietnamese level of packaging technology is inadequate to meet international standards, Vietnamese materials are lacking in quality, costs are too high and must depend upon imports. Packaging for domestic is adequate but needs much improvement for export market to meet international standards.

What could the PTDC do to help him? Mr. Hai said:

1. Provide him with food package samples from the development countries, primarily candy and biscuits, so that they can see the quality level required for exports.

2. Provide him with technical data on the properties of films he is using (he gave us samples) and of better films used elsewhere.

3. From who in the world can he buy the best vacuum sealer?

REPORT OF VISIT

Date: 27 March 1992

Contact : NGUYEN LAM VIEN
Director
Company : NHA BEXIMS/MORATEX
Address : 26/6B LIEN TINH LO 15 - NHA BE
Telephone: 774676-778038
Reporter : GERRY TRACY

Accompanied by LE THANH HA and BUI NGOC THIEN, we spent a pleasant 1.5 hours in discussion. Mr. VIEN was very supportive of the PTDC efforts to improve the quality of packaging in Vietnam and looks forward to services to be provided by PTDC in evaluating his flexible package needs and recommending suitable structures an potential local sources of supply.

PRODUCTS/PROCESSES

His small operation vacuum fried jackfruit, sliced bananas, sliced pineapples and other fruits and vegetables, using equipment from Taiwan. Fruits are dried to 2% moisture level. His "Nabifood" brand sold in Vietnam is packed in 50g preformed bags purchased from Taiwan.

Most of his volume is packed in large heavy construction bags supplied by his importer in Taiwan for bulk shipment to them, where it is repackaged into clear plastic bags under the trademark "Frusnex" for sale in Taiwan and export to other Pacific Rim countries. This clear bags also hold a thermoformed tray and a small packet of dessicant.

PACKAGING EQUIPMENTS

The structure must provide one year shelf life and gain no more than 15% moisture when using consumer 50g packages. Heavy bulk bags for export assure no moisture gain so that product is 2% moisture when repacked.

REQUEST BY Mr. VIEN

Mr. VIEN would like to phone or visit him and inform him of the cost an timing when the PTDC could supply him with this information before proceeding with the project:

1. Testing of materials now being used by Mr. Vien to determine their structural specifications. Samples were provided.

2. Alternate material specifications that can be used that would meet the shelf life requirements:

   a. Imported bags meeting his graphic quality standards
   b. Domestic Vietnamese manufacture, and what companies could meet his standards.

REPORT OF VISIT

Date: April 1, 1992

Contact : TRAN VAN TU,
DIRECTOR
MRS. VO THI BICH HUYEN
VICE DIRECTOR

Company : SAIGON PACKAGING EXPORT COMPANY (SPACEX)

Office : 16-18 HAI BA TRUNG ST., DISTRICT 1, HCMC

Tel : 297031 - 296008

Reporter : GERRY TRACY

Accompanied by Mr. CHANH (National Project Coordinator of PTDC) and Mr. HA (Training and Consulting, PTDC) we met at SPACEX's office. Mr. TU outlined the history of SPACEX, starting in 1976 making wooden boxes, then bamboo boxes, then in 1978 corrugated containers where they now have 40 factories.

In 1975 started laminating films for instant noodles for army rations, starting up flexible operations again in 1984-1985 for dried bananas, now films and laminations widely used for foods and pharmaceuticals. Operations include blown film, extrusion and coating. Combinations include Cel/PE, OPP/P.E, PET/P.E, CEL/FOIL/PE, ON/PE and many others.

Upon being asked by Mr. TU what I would suggest to improve flexible packaging in Vietnam, I responded that my survey had not been completed but that my initial assessment was that new materials were available with high oxygen and moisture barriers that could be used to replace more costly foil containing structures. Also that later model heat sealing machines with control over time, temperature and pressure should be used, and new sealant coatings should be tried. I suggested that preformed pouches should have a notch in the top fin seal with printed instructions to "open here", and that tight pull apart seals could be made with sealant layers other than LDPE.

Asked if I could be more specific about some new films, I mentioned " SARANEX" from DOW-Chemical Co. , and Ethylene Acrylic Acids from Dow as sealant. I have since acquired the technical data on "SARANEX" for the PTDC to communicate this information to the appropriate staff at SPACEX. More detailed technical information on Dow's "Primacor" than that which appeared in the reprint from Tappi journal Jan 89 could be requested by interested staff from Mr. A. Hapiz Abdullah at Dow, Hong Kong. Materials could be imported through Singapore by Mr. Nhan of Inchcape Vietnam Limited.

REPORT OF VISIT

Date : 1/4/92

Contact :
Factory : AGREX SAIGON, TAN THUAN EXPORT FOODSTUFFS PROCESSING FACTORY
Address : 58 VO VAN TAN Street, DISTRICT 3, HCMC
Tel : 296606
Reporter: GERRY TRACY

This factory packs frozen marine products in bulk and packaged for retail sales by packers at the importing destinations. Products include shrimp, prawns, crabs, squid and fish, cleaned and frozen. They also make hors douvres, fully prepared and frozen, ready for the oven.

PACKAGING OPERATIONS

Packing is in preformed LDPE bags, heat sealed after filling, then cased and palletized.

Management would like to add packing into retail display cartons, to add more value to their exports and make it easier for the importer to directly transport his product to market.

This would improve quality because frozen marine products would not undergo a partial thawing while being repacked at the importer. They asked what paperboard structure should be used, what kind of wax for waxing cartons, and where can he buy hot melt adhesives for sealing cartons.

I am unsure of the materials, but believe them to be solid bleached sulfite and waxed with microcrystalline wax.

Upon returning to the U.S., I will send representative film and carton packs of frozen marine products to Mr.Subramanian for PTDC's presentation to Agrex Saigon.

My knowledge of hot melt adhesives and applicators is limited, but a schematic of a simple applicator could be made locally. Hot melt applicators and adhesives should be readily available from Singapore or Hongkong sources. Wiley's "Encyclopedia of Packaging" page 15 defines hot melt adhesives as "EVA copolymer compounded with waxes (paraffin or microcrystalline) and tackifying agents, plus stabilizers and anti-oxidants".

REPORT OF VISIT

Date: April 7 1992

Contact : TRAN THANH TRUNG
GENERAL MANAGER

Factory : SEAPRODEX TIEN GIANG

Address : TAN MY CHANH, MY THO CITY, TIEN GIANG Province

Tel : 72860 - 72913

Reporter : GERRY TRACY

Shrimp and prawns, raw or peeled, individually quick frozen or frozen in blocks are packaged here for export to Japan and France.

The primary package consists of these frozen marine products tightly stacked in rectangular metal trays consisting of 1.7kg shrimp and filled with 0.3 kg water, then frozen. Frozen blocks are then inserted into poly bags with the open end unsealed, then inserted into end-loaded tuck end paperboard cartons, 6 cartons per wax coated corrugated container which are banded.

There were no deficiencies in packaging methods, except:

1. Unsealed poly bag wraps over frozen blocks allow contamination in transit. However, receiving importers insist on unsealed bags.

2. Bottoms of corrugated containers were leaf folded before filling, losing strength in bottoms. Better to close minor flaps, then major flaps and tape bottoms.

REPORT OF VISIT

Date: April 9, 1992

Contact : LY CHIEN TRANH
DIRECTOR
DANG THUY DUONG
MANAGER
Company : AGREX SAIGON
Office : TAN THUAN EXPORT PROCESSING ZONE, NHA BE DISTRICT
HCMC
Tel : 729548
Reporter : GERRY TRACY

This is one of 12 cashew processing factories in Vietnam. They have a short 3 month season when the factory operates to capacity. They operate with short working capital of only $1 million, and export bulk unshelled cashews to get working capital to buy cashews from farmers during the crop season, and to pay their workers. Many women are employed to shell the cashews, and sort them by color and uniformity. Most of the production at this factory is exported.

Processing Operations:

1. Cashews are fried in oil at 150°c (mixture of sunflower oil and peanut oil) and de-oiled in a centrifuge.

2. Shells are cracked individually in a manual hand press, then shells removed manually.

3. Color, size and uniformity sorting manually.

4. Packaging

Packaging Operations:

One of the few factories visited that had done any market research on the types of packages used by their competitors in other countries. They showed us samples of various packs of cashews, from 45 gram fill to 100 grams, mostly produced in West Germany with cashews from India.

PACKAGING TYPES

A. Most of their production is in bulk shipment to France in square tins (25x25cm and 35 cm tall) mechanically fabricated by another factory in HCMC. Completion of these tins to make them vacuum tight is done manually, by hand soldering the side seam and top and bottom seams. A single friction metal plug is the closure, compound lined manually immediately after filling with 11 kg of cashews, inserted into a vacuum chamber that draws the vacuum and seals the lid when maximum vacuum has been achieved.

Two 11 kg cans are packed in corrugated cases which are strapped, then palletized manually (interlocking pattern) as high as a man can reach.

I suggested that perhaps a strong plastic/foil pouch could be used at much lower cost, perhaps holding $5^{1/2}$ kilos each, using 5 layer corrugated B/C flute cases to hold 4 pouches, with adequate strength for export. Upon my return to the US. I will investigate how cashews are shipped there from Brazil, and this information will be transferred to PTDC and then Agrex Saigon for their consideration.

B. 45 to 50 gr. pouches were packed in preformed pouches supplied by SPACEX, made of OPP/foil/LDPE and sold in Vietnam. They now pack in pouches supplies by Singapore made of OPP/MCPP/PE, a lower cost structure with excellent oxygen and light barriers to retard oxidations of oils. Upon return to the US, I will send typical cashew pouches to the PTDC for structural analysis, who will pass this information to AGREX SAIGON with recommendations of local factories who might supply similar pouches.

REPORT OF VISIT

Date : 16 April 1992

Contact : Mr. DANG NGOC QUYNH
Director of DIELAC MILK FACTORY
Address : BIEN HOA INDUSTRIAL ZONE
Tel : 01 613 36115
Reporter: GERRY TRACY

This Baby Milk Powder Factory was visited to collect data on physical and chemical properties of baby milk powder, and for an adult chocolate flavored beverage, tradenamed "OVALTINE" by The Wander Co. which is also packaged in tins here.

This is the project to develop a prototype flexible package for these products, at lower cost than metal tins. (Ref: Duty of Expert in Job Description)

In discussions with Mr. QUYNH, it was decided that the package for Ovaltine should be developed first because it is ambient filled (not vacuum and nitrogen flushed) whereas baby milk powder needs the better shelf life protection of nitrogen packs. After gaining experience with a form/fill/machine with Ovaltine, they will be better equipped by technology to convert the machine to a gas pack for baby milk powder.

Gerry Tracy promised to gather sample product from the U.S. and forward it to the P.T.D.C. for structural material identification, sizing, etc. to develop a similar prototype for presentation and review by Mr. QUYNH. Mr. Tracy expects to have this material to P.T.D.C. by 1 June 92, with costs and utility requirements for a vertical F/F/S machine of U.S. manufacture. QUYNH will concurrently get equipment costs from NESTLE, and European representatives of SIG and ROVEMA for comparison of prices.

Technical Data Gathered

Development of the pouch size could be based upon General Foods International Coffee (GFIC), a similar product to Ovaltine except coffee flavored rather than chocolate flavored.

G.F.I.C. is filled with 18.4g powdered having a density of 0.74g/ml on a horizontal F/F/S machine made by Bartelt which folds the bottom and heat seals the sides and top seam. It measures 73mm wide and 135mm tall or 9,855mm² of material per pouch. Side seams are 8mm wide and the top seam is 22mm. Fillable pouch area is 57mm x 113mm.

Ovaltine has a density of 0.58 and pouches should be sized for a 20 gram fill for each serving, the recipe is to add this to a glass of milk or a cup (200cc) of boiled water, the equivalent of 2 tablespoons per serving.

Baby milk powder has a density of 0.58 and a feeding size in 200cc of boiled water is 2 tablespoons.

Each tin can of Ovaltine now contains powder sufficient to make 12.5 servings (450g/tin).

This product is hydroscopic and needs good moisture barrier for long tropical shelf life to prevent it from rehydration and caking.

The selection of the film material will be determined somewhat by the type of F/F/S machine because horizontals run best with a paper containing structure while verticals run well without paper. Mr. Tracy estimates that a structure having M.V.T.R. of 2g/m²/day should give 18 to 24 months shelf life, and 4g/m²/day 9 to 12 months shelf life.

This will be determined by shelf life tests that will be part of the program for development to be outlined by Mr. Tracy by 1 June 1992.

SEMINAR PRESENTATION

I Quality Preservation of Foods by Packaging

II Package Development Checklist

III Phases of Package Development

IV Predicting shelf life of water and oxygen sensitive foods in pouches:

A. Simplified differential mass balance method

B. Barrier properties of films for foods

C. Formula for determining barrier properties of some film combination

V Film and pouch packaging development phases

VI New product and packaging planning

VII Review changing packaging for improvement

I. QUALITY PRESERVATION OF FOODS BY PACKAGING

I. Changes in quality from manufacturer to consumer:

A. Microbiological infestation by:

1. Fungi
2. Yeasts
3. Molds
4. Bacteria

B. Physical changes:

1. Reabsorption or loss of water, changes in texture
2. Decrease in flavor, pick up other odor.

C. Chemical changes:

1. Non-enzymatic reactions

II. Changes occur through ecological influences by:

A. Humidity

Equilibrium moisture content influences spoilage, microbial infection, fat rancidity and enzymatic changes. (Example: taste and color changes with dried vegetables, loss of crispness in breads and biscuits).

B. Oxygen

Loss of vitamin C in juices, oxidation of unsaturated fatty acids, rancidity, change in flavor and color of all fat containing foods.

In fruit juices, only 10mg/kg oxygen max. allowable for vitamin C retention.

C. Light

Meats and sausages turn from red to grayish color. Before graying, meats develop an unpleasant taste as a result of oxygen and light effects.

D. Temperature

Sausages must be kept in controlled temperature for 30 to 60 days while curing to have uniform color , not red in the middle (uncured) and brown outside. In distribution, best to keep away from high temperatures to prevent fats from weeping out of the casings.

(1) Summary outline from "European Packaging Newsletter" vol 20 No. 1st December 1987, article "Quality Preservation of Food by Packaging", Pg 19-20.

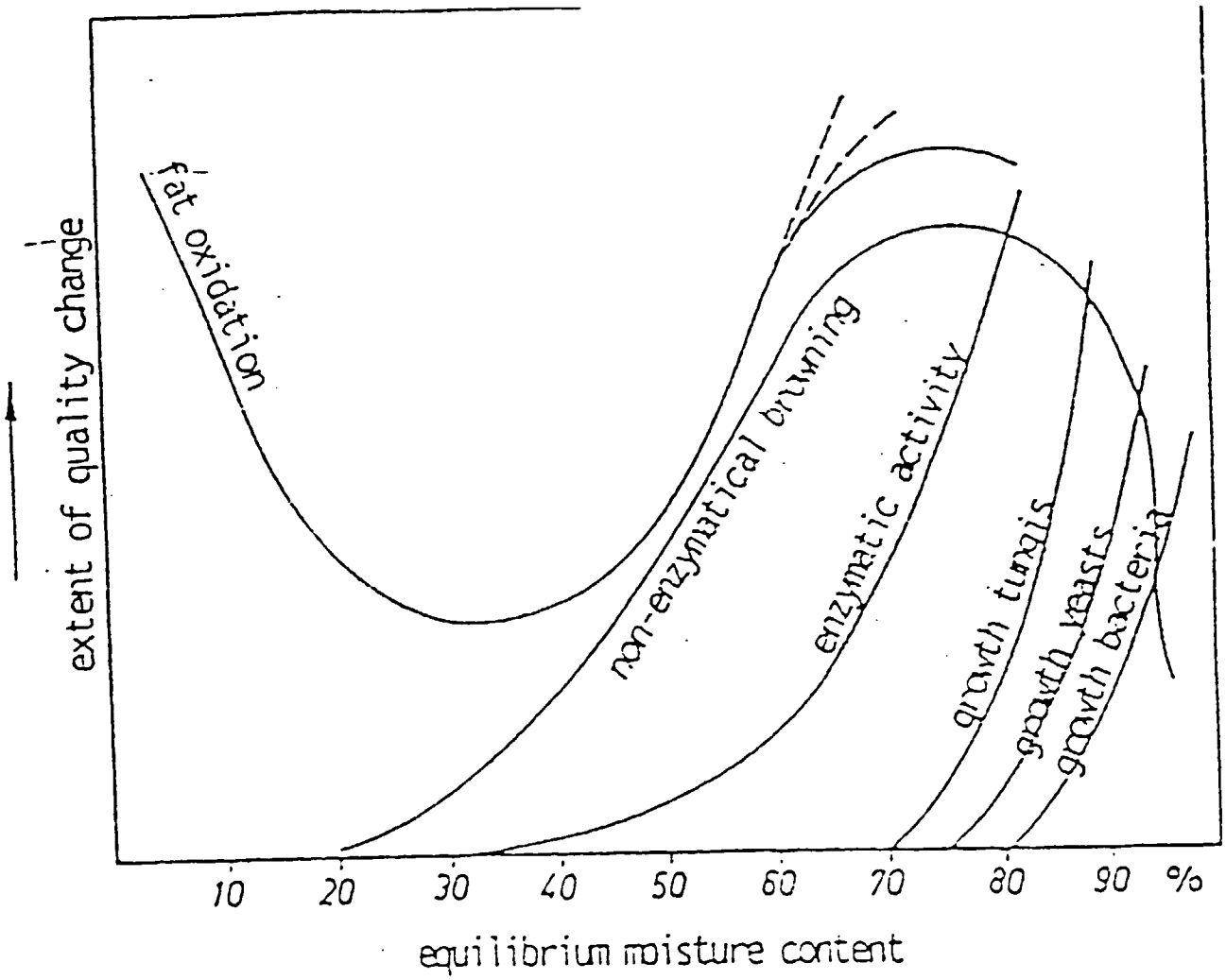


Illustration 1. Diagram of dependency of various spoilage possibilities on equilibrium moisture content with constant temperature and time (R. Heiss, K. Eichner West Germany packaging research laboratory.)

II. PACKAGE DEVELOPMENT CHECKLIST

I) PRIMARY PACKAGE REQUIREMENTS

A. Product Attributes

Distribution Mode [ ] Ambient [ ] Refrigerated [ ] Frozen

Moisture - Initial_____Critical_____

Oxygen Causes [ ] Color Change [ ] Spoilage [ ] Other

Bulk Density _____

Frangibility _____

Unusual Ingredients_____

Temp, When packed _____

pH _____

Light Sensitivity _____

Other (Describe) _____

B. Package Attributes - Environmental

Shelf Life Desired _____

Aslt Methods, Test for_____

_____

Action Standards _____

_____

Analytical Chemical _____

Organoleptic (Texture) _____

Sensory (Smell, Taste) _____

C. Package Attributes - Physical Style

Primary Package Appearance [ ] Transparent

[ ] Contact Clear

[ ] Opaque

[ ] Colored

Materials _____

Closure _____

Shipper _____

Total Allowabe Package Materials Cost _____

Type of Packaging Equipment

Lab _____

Pilot Plant Machine Trials _____

Plant Trials _____

Line Speech _____

II. Quantities

Aslt Tests _____

Physical Package Tests _____

Clt, Hut, Market Research _____

Test market _____

Commercialization, Tests _____

National Production _____

III. Timing

_____ Package Availability to Pack for Aslt, Physical Package Tests

_____ Complete Aslts

_____ Complete Physical Tests

_____ Plant Trials

_____ Supplier Leadtime, Special Tools

_____ Supplier Leadtime, to Start-up

_____ Packaging Equipment Leadtime

_____ Commercialization Target

IV Packaging System

	Lab Tests	Test Market	National
Equipment Survey			
Recommended			
Comments			
Personnel Required			
Quantity			
Qualifications			
Handling to Filler			
Cleaning			
Filling			
Closing			
Checkweighing			
Code Dating			
Labeling			
Casing			
Palletizing			

III. PHASES OF PACKAGING DEVELOPMENT

I- FUNCTION OF THE PACKAGE - SYSTEM APPROACH

A- MAINTAIN PRODUCT QUALITY ,SAFTY , SHELF LIFE.

1) MODE OF PRODUCT DEGRADATION

A- MOISTURE , LOSS OR GAIN

B- EFFECT OF OXYGEN, NITROGEN

C- OTHER PRODUCT MIGRANTS (AROMATIC HYDROCARBONS . STRESS CRACK AGENTS , FLAVOUR,ALCOHOL, FATS / OILS)

D- COLOR , TEXTURAL CHANGES.

2 - STERILITY REQUIRED AND SEAL INTEGRITY .

A- ASEPTIC, RETORTED

B. PASTEURIZED

C. HOT FILL

D. AMBIENT FILL

3- DISTRIBUTION SYSTEM AND SHELF LIFE

A. FROZEN

B. REFRIGERATED

C. AMBIENT

D. THEORETICAL AND PRACTICAL

II- LITERATURE SEARCH AND VALUE ANALYSIS

A- FEASABILITY STUDY

1- TECHNICAL OBJECTIVES

2- CRITICAL ISSUES

3- TECHNICAL APPROACH

4- ODDS OF SUCCESSES

5- TIMING

6- COSTS AND RESOURCES

B- LITERATURE SEARCH OF CRITICAL ISSUES

1- R&D LIBRARY , PATENT SEARCH

2- SUPPLIERS

3- COMPETITIVE ACTIVITY

C- VALUE ANALYSIS

1- BARRIER PROPERTIES VS. COST IN PRIMARY ,

SECONDARY AND TERTIARY PACKAGING

2- FUNCTIONAL BENEFITS , EACH PACKAGE COMPONENT.

COMBINE AND SIMPLIFY .

3- STANDARDIZED VS. CUSTOM .

III- PACKAGE DEVELOPMENT PHASE

A- CONCEPT SEARCH

1- ORDER-OF-MAGNITUDE COSTS OF SPECIFICS - SIZE SHAPES , MATERIALS , NARROW THE FIELD.

2- FILLING LINE EQUIPMENT COSTS , AVAILABILITY.

B DESIGN

1- FUNCTIONAL ATTRIBUTES .

2- GRAPHIC TREATMENT .

C- MODELS

1- 3D TO DEMONSTRATE CONCEPT FOR COMPLIANCE

TO MARKETING STRATEGY OR GROUP SESSION INTERVIEW,

SHELF IMPACT STUDIES .

IV. PREDICTING SHELF LIFE OF WATER SENSITIVE FOODS IN POUCHES

A. SIMPLIFIED DIFFERENTIAL MASS BALANCE METHOD (1)

I. Determine product water content

Formula: $W = \frac{M}{G}$

W = water content, %

M = water in product, grams

G = weight of product, grams

II. Steady state moisture gain in product

Formula : $dM = QA(Pa-Pi)d_t$

dM = moisture gain in product per day(s)

Q = MVTR (g/m^2)

Pa = relative humidity outside the package

Pi = relative humidity inside the package

A = inner surface of the package (m^2)

t = time, days

III. More sophisticated predictions (2)

(1) FRICK'S LAW - "PREDICTION OF SHELF LIFE OF PACKAGED WATER SENSITIVE FOODS", Rudolph, F.B., Unilever Research Laboratorium, 1986, Vlaaringen (The Netherlands)

(2) For more sophisticated methods to predict shelf life over a range of relative humidities outside the package, and the ERH curve of the product, see (1) or obtain C.M.S.L.P. computer model (Computer Monthly Shelf Life Prediction) from Kenneth S. Marsh Associates, 425 Dacy St., Woodstock, IL 60098 U.S.A.

B. BARRIER PROPERTIES OF FILMS FOR FOODS (1)

FILM MATERIAL	MOISTURE VAPOR TRANSMISSION RATE (30m film @40C,90RH)		OXYGEN TRANSMISSION RATE (25m film, 35°C)	
	$gr/m^2/day$	Rating order	$cm^3/m^2/day$	Rating (3)
L.D.P.E.	15 - 20	5	6,500 - 8,500	Poor
CEL	5 - 15	2	2,000 - 3,000	Poor
ON	134	6	51	Good, adequate for most foods
P.E.T.	25 - 30	5	40 - 50	Good, adequate for most foods
O.P.P.	7	4	2,000 - 2,500	Poor
SARANEX (Dow coex-PE/PVDC/PE)	15 - 30	2	9	Very low
E.V.O.H.	19	5	3	Extra low
OPP(12m)M aln (4)	3	2	16	Low, good for tropical conditions
PET(12m)M aln (4)	4	3	8	Very low
PET(12m)Glass (2)	-2	1	-2	

(1) Table from EVAL Co. of America Technical Bulletin #110 is reproduced in part.
(2) GT-S film supplied by Toyo Ink Co. Ltd., Tokyo, data from their product brochure.
(3) Generally accepted 12 month shelf life rating for most oxygen-sensitive foods:

O_2 Trans. rate	Rating
0 - 4	Extra low
5 - 15	Very low
15 - 32	Low, good for tropical conditions
33 - 59	Good, adequate for most foods
60 - 89	Moderate
90 - over	Poor

(4) 12 micron metallized film at 2.4 Optical density, calculations based upon conversion tables of typical films, "Wiley Encyclopedia of packaging" John Wiley & Co. 1986, p.444 courtesy of I.C.I. America.

C. FORMULA (1) FOR DETERMINING BARRIER PROPERTIES OF COMBINED FLEXIBLE STRUCTURES:

$$\frac{1}{\text{TOTAL PERMEABILITY}} = \frac{\text{THICKNESS OF A}}{\text{TOTAL THICKNESS X PERM OF A}} + \frac{\text{TOTAL THICKNESS B}}{\text{TOTAL THICKNESS X PERM B}}$$

STRUCTURE	MVTR (2) (G/M2/DAY)	OXYGEN TRANSMISSION (2) (CM3/CM2)
PET (12m)/LDPE (50m)	15.5	93
PET (12m)/MET ALN LDPE (39m)	1.55	232
PET (12m)/ADH/MET ALN PET(12m) /LDPE (50m)	.775	1.24

(1) HANLON, J.A. "HANDBOOK of PACKAGE ENGINEERING", Pg 4-16
(2) "Wiley Encyclopedia of Packaging" John Wiley & Co., 1986, Pg 462

MATERIAL	TEST	TEST METHOD (1)	VALUE	VARIATION	CLASSIFICATION OF DEFECTS AND AQL LEVEL
PET FILM	THICKNESS	18:2509-1984	(12U)	(+/-0.5U)	I
	ELONGATION ELEMENDORF	180.4383-1983	(60%)	(+/-5%)	II
	TEAR ELEMENDORF	180.6383-1983	(10g or less)		-
	IMPACT	NOTCHED IZOD 180.180 (1982)123	(4.8)	(+/-0.5)	III
	O2 PERM.	MANOMETRIC 180.2556-1974	(35cc/m2)	(+/-5)	II
	MVTR	GRAVOMETRIC 180.2528-1974	(15g/m2)	(+/-3)	I
LDPE FILM	THICKNESS	18:2508-1984	(40U)	(+/-1U)	I
	TEAR TEST	ELEMENDORF 180.6383-1983	(20g or less)		
	IMPACT	NOTCHED IZOD 180.180-1982	(6.2)	(+/-0.6)	II
	O2 PERM.	MANOMETRIC	(100 cc/m²)	(+/-10)	III
	MVTR	GRAVOMETRIC	(15g/m²)	(+/-3)	I

MATERIAL	TEST	TEST METHOD	VALUE	VARIATION	CLASSIFICATION OF DEFECTS AND AQL LEVEL
Laminated Film PET(12u)/LDPE (40u)	Thickness (a)	ISO: 2508 - 1984	53/u	(+/- 1.5u)	I
	or perm.	ISO: 2556-1974	(93cc/cm2)	(+/- 10)	I
	MVTR	ISO: 2528-1974	(15.5g/m²)	(+/- 2)	I
	Heat seal (b) strength	ASTM 1 904 - 84	(g/cm2)	(+/- 3%)	I
	Bond (c) Strength	ASTM D 903 - 49	(g/cm2)	(+/- 3%)	I
	Optical (d) properties	ASTM D 2457 ASTM D 1003	(refractive index) (percent Haze)	(+/- 2%)	I
	Tensile (e) strength	I:SO 2508 - 84	(g/cm)	(+/-3%)	I

I. - Compilation of Brown, R.P "Handbook of Plastic Test Methods" 3rd Ed. and Iyer, H.R., packaging India Dec 91 - Jan 92" Indian Institute of Packaging, page 35 and Leonard, E.A. "Packaging specifications, Purchasing and Quality Control" 3rd Ed.

(1) CONDITIONING OF SAMPLES BEFORE TESTING:

TEST METHOD: ISO:291-1974
CONDITION : Tropical, 27°C, 65% RH, pressure 86 to 106 KPa

TEST	SIGNIFICANCE OF TESTS
(a) Thickness	- Direct influence on the physical properties and barrier properties
(b) Heat seal strength	- Heat sealaibility of materials, seal integrity, package performance
(c) Bond strength	- Barrier properties influenced by inter-layer bond strength
(d) Optical properties	- Essential for sale appeal see through clarify, enhancement of print
(e) Tensile strength	- Durability and serviceability of packaging operations

PACKAGE MATERIAL SPECIFICATION (Example) (I)

TYPE : (Film, lamination, coextrusion, coated film)

SIZE : (Roll width, roll diameter, core diameter, cut size)

OUTAGE : (pouches per roll)

DESCRIPTION:

(5 color gravure reverse printed 12 micron polyester film adhesive laminated to 40 micron low density polyethylene)

USAGE:

(Film must be capable of operation on a vertical form \ fill \ seal machine of "X" manufacturer at the rate of "Y" packages per minute under normal operating conditions and\or manufacture into back-fin sealed pouches)

V. FILM AND POUCH PACKAGING DEVELOPMENT PHASES

PHASE I — DETERMINE A TENTATIVE FILM SPECIFICATION

A. Machinability

1. Sealing time, temperature, pressure
2. Lubricants, slip characteristics
3. Aging and handling characteristics, types and amounts of:
   a. Anti-oxidants (BHT,BHA,TBHQ)
   b. U.V. Stabilizers
   c. Anti-static agents
   d. Anti-block agents

B. PRODUCT SHELF LIFE

1. Chemical properties, migrants to and from packaging.
2. Time and mode of failure, tentative film specification for moisture and oxygen barriers required for:
   a. Domestic sales, local
   b. Domestic sales, national
   c. Export

C. TENTATIVE SPECIFICATIONS OF SECONDARY AND TERTIARY PACKAGING, for:

1. Distribution to the retail level
2. Retail display

D. COSTS OF ALL PACKAGING MATERIALS

PHASE	ACTIVITY
II	DEVELOP AND TEST PROTOTYPE SAMPLES
	A. CONDUCT SHELF LIFE TESTS OF MATERIAL VARIABLES, at:
	1. Ambient tropical (22°C, 65% R.H.)
	2. Accellerated (38°C, 93% R.H.)
	a. As packed
	b. After simulated distribution test.
	B. TASTE TEST OF SHELF LIFE SAMPLES BY ORGANO-PANEL
	1. Blind test, 4 - 6 weeks apart, quantitative measure of taste and smell of these variables:
	a. Control (frozen and thawed)
	b. Ambient samples
	c. Accellerated samples
III	RESTAGE - REPEAT ALL OR SECTIONS OF PHASES I AND/OR II AS NECESSARY, BASED ON RESULTS FROM II B
IV	DETERMINE COSTS FOR PACKAGING, DECISION TO MARKET PRODUCT AS DEVELOPED
V	FINALIZE SPECIFICATIONS
VI	ORDER MATERIALS
VII	APPROVE MATERIALS RECIEVED
VIII	START PACKING
IX	SHIP TO MARKET
X	EVALUATE PACKS IN MARKET.

VI. NEW PRODUCT AND PACKAGING PLANNING

SCREENING

- Product and Packaging defination
- Preliminary Technical Assessment
- Competitive Package Evaluation

FEASIBILITY	RESPONSIBILITY	CONSTRIBUTIONS
• Business Objectives	Marketing	Profit Improvement Opportunity
• Technical Objective	Team	------
• Concept Development	Marketing	Tentative Formulation
• Preliminary Product /Package Prototypes	Team	3 Optional Package Concepts w/Materials & Equipment Costs Product & Packaging Flow Diagrams
• Technical Assessment	Team	Contribution from Engineering & Mfg.
• Financial Analysis (1)	Finance	Material & Equipment Costs

DEVELOPMENT

• Project Plan /Timetable	Marketing	Packaging Timetable
• Publish Technical Plan	Team	Packaging Issues/ Approach/Status/ Timetables/Odds. Decision Rules

DEVELOPMENT	RESPONSIBILITY	CONTRIBUTIONS
• Publish Package Design Criteria (2)	Packaging	Select Suppliers and Contributions/Concurrence with Q.A., Plant, Mfg. & Engineering of Overall Unit Operations
• Secure Prototype Packages for ASLT, CLT, HUT	Packing and Suppliers	
- Films, Standard		
- Films, Special		
- Cartons, Unprinted		
- Cases		
- Thermoforms		
- Injection, Molded		
- P.S. Labels		
• Evaluate Materials for Compliance to Tentative Spec	Packaging	
• Package Testing with Pilot Plant Product	Packaging	
- Shock & Vibration	Packaging	
- Pouch/Seal Intergrity	Packing	
- Shelf Life	Team	
• Plant Trial Support		
- Package Material Specification & Drawing	Packaging Packaging	
- Order Packing Materials	Packaging & Suppliers	
- Evalute Plant Trial Packs	Packaging	
• Data Collection for Financial Management Approval to proceed to Commercial Pack	Marketing	Technical Assessment to Commercialize
• Complete Product/ Packaging Specs	Team	Packaging Info. Section, PMS's, FPS's, TP's All Packaging Materials Specs, finished Packaging Specs, Test Procedures written and approved

COMMERCIALIZATION	RESPONSIBILITY	CONTRIBUTION
• Package Design	Marketing	Photo, Label Devel.
• Facility Design Criteria	Engineering	Packaging Contribution
• Manufacturing Plan	Manufacturing	Packaging Contribution
• Financial Approval	Engineering	Packaging Contribution
• Detail Design/Unit Operations	Engineering	Packaging Contribution
• Installation & Shakedown	Engineering	Packaging Contribution

VII. CHANGING PACKAGING FOR IMPROVEMENT

REVIEW:

I. PRODUCT/PACKAGE POSITIONING

- WHAT
- HOW
- TO WHOM
- REVIEW GRAPHICS & SUPPORT COPY TO MEET TARGET

II. PACKAGE MATERIAL & STRUCTURAL DESIGN

- NEW MATERIALS MORE COST EFFECTIVE
- INCREASE QUALITY PERCEPTION
- INCREASE SHELF LIFE & DISTRIBUTION AREA

III. OPENING FEATURES

- CONVENIENCE TO CONSUMERS, MORE SATISFIED, NOTCH ON POUCH.

IV. BACK PANEL GRAPHICS

- MANDATORY COPY - INGREDIENTS LIST, SOURCE, QUALITY STATEMENTS, INSTRUCTIONS ON USE.

- ALTERNATE USE SUGGESTIONS.

Backstopping officer's comments

Flexible packaging technology is a matter of great importance nowadays, due to the savings which the packages concerned currently achieve in terms of materials and energy.

The Packaging Technology Development Centre (PTDC) at Ho Chi Minh City is devoted to a large extent to the field of flexible packaging materials manufacture, conversion and final utilization, carrying out related activities of information, training and consultancy for technical support to the national industries concerned.

The flexible packaging materials have a strong advantage in the possibility of joining layers of different basic materials, to combine properties which could not be found in one material alone.

Up to very recently only single flexible packaging materials were used in Viet Nam. Neither laminates nor co-extruded materials were produced locally.

The mission of the expert Mr. Tracy was specifically aimed at assisting the national counterparts to get acquainted with the fundamentals and methodology for the structural design, specification and quality control of flexible packages for specific products.

In this connection the expert gathered selected technical information at home office before his departure to Ho Chi Minh City. At the project site he trained technical staff from PTDC, collaborated with a main contribution to a symposium on flexible packaging technology open to participants from the industries and visited several manufacturers and users of flexible packages, accompanied by specialists from the PTDC.

Details of technology and economics of flexible packaging were discussed with professionals from the industries concerned, links between PTDC and industries were further developed and ad hoc advice was provided within the framework of the visits.

The recommendations of the expert are mainly referred to complementary laboratory equipment, further training of the counterparts, compilation of a national packaging directory and publication of a technical magazine of PTDC for permanent contact with the industries.

These recommendations are pertinent and worth of being submitted to the national authorities for their final consideration.