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BANGLADESH

Technical report: Packaging technology
Findings and recommendations*

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

Based on the work of Mr. P. V. Narayanan,
consultant in packaging technology

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* This document has not been edited.

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		FORMULATION

ABSTRACT

The Expert's assignment was for a period of 1 m/m, commenced 24th July, 1990 and concluded 22nd August, 1990. The job description mainly aimed at a survey of the existing system of packaging of pesticides, conducting a Workshop on Packaging with emphasis on pesticides, orientation programme for counterpart staff, providing an outline for preparation of specifications for packaging materials and packages for pesticides, and drawing-up a guideline procedure for approval of packaging system for pesticides.

A series of visits to various pesticide industries, dealers and retailers were undertaken to assess the current system of packaging: packaging materials and packages used, method of storage, handling and distribution. Reports on each of the visits was drawn-up. A number of observations were made. These are envisaged to streamline the packaging line operations, use of appropriate packaging materials and packages, better handling and storage, as well as quality assurance. (ANNEXURES - IV to XIV and ANNEXURE - XVIII).

Technical discussion sessions were conducted on various aspects of packaging for the benefit of the counterpart staff. These mainly covered package development factors, alternate media available, assessment of properties and their significance, selection criteria etc. The discussions were

also oriented to the existing systems of packaging, observations made and practical demonstrations of material identification, evaluation of some basic properties etc.

A three day Workshop on Packaging was organised at the Conference Room of the Plant Protection Wing. About 25 delegates from the pesticide industry and plant protection wing participated. The Workshop highlighted - packaging concepts, effect of environmental conditions on packaging materials and packages, storage conditions, specific aspects of packaging of pesticides, newer concepts, development of specifications, and quality control. A variety of packaging materials and packages are displayed and used for the Workshop discussion. Specific case studies from existing packaging practices also were taken-up as illustrative examples. A number of slides and transparencies were used as programme aids. (ANNEXURES - XV, XVI and XVII).

In a joint meeting between the members of the pesticide Association of Bangladesh, officials of the Plant Protection Wing and the Expert, the need to review the existing packaging systems with specific reference to packaging operations, updating specifications, introducing appropriate quality control measures and following a set-guideline for arriving at an approved packaging system was highlighted.

As there is an immediate need to draw-up complete specification details for packaging materials and containers, all important parameters in respect of each material and form/package are drawn-up with drawing details in some cases and provided. (ANNEXURE - XIX).

Packages including all components for pesticides should be an approved one. The details should be available as a national standard. In order to arrive at an approved system certain tests should be done to establish the product package compatibility, shelf-life, material adequacy and package transportworthiness. Towards this a guideline - procedure is drawn-up. (ANNEXURE - XXII).

1. INTRODUCTION

1.1 BACKGROUND

As an innovative approach, UNDP/UNIDO sponsored a Project in 1982, to have a regional approach to address to the various problems associated with the production and use of pesticides. This project in its first phase provided training, consultancy services and organised seminars, workshops, covering number of aspects related to pesticides. Based on the benefits accrued, the Project has been extended till 1992 with emphasis on formulation, effluent control, environmental toxicology, quality control and residue analysis.

1.2 JOB DESCRIPTION

The job description is outlined in ANNEXURE - I.

1.3 OFFICIAL ARRANGEMENT

The mission was assigned through UNIDO correspondence PRU/90/PRAS/APP, Post DP/RAS/88/031/11-53/J 13426 dated 11th July, 1990.

The Expert entered the field on 24th July, 1990.

The work plan was discussed with Mr M. Islam, UNIDO SECTION, New Delhi; Dr S. P. Dhua, Regional Co-ordinator, RENPAP; Mr A. W. Sissingh, UNIDO Country Director, Dhaka and Mr Md. Mazharul Haq. Director, Deptt. of Agril. Extn., Plant Protection Wing, Dhaka.

1.4 COUNTERPART STAFF

The Co-ordination is by Mr Md. Mazharul Haq. Director, assisted by Mr M.A.K. Azad, Entomologist, and Mr Mohiuddin Ahmed, Senior Chemist, besides Deputy Director Mr A.S.M. Akramuzzaman Khan.

Field and laboratory study and training counterstaff are:

1. Mr Mohiuddin Ahmed, Senior Chemist
2. Mr MD. Mahbub-UR-Rahman Bhuiyan, Chemist
3. Mr Afiquur Rahman Khan, Chemist
4. Mr Tarun Ranjan Sarkar

1.5 OBJECTIVES OF THE PROJECT

The objectives remain the same as outlined in the original document. This particular mission has emphasis on the packaging requirements for pesticides.

1.6 PROGRAMME

The programme of visits, orientation lectures and workshop as finalised with Director, Plant Protection Wing, is at ANNEXURE - II.

1.7 PERSONNEL MET

The various personnel met during visits, meetings, etc. are listed in ANNEXURE - III.

2. SUBSTANTIVE SECTIONS

ACTIVITIES AND FINDINGS

2.1 GENERAL

Initial discussions were held with the Director and officials of Plant Protection Wing on the set-up of the pesticides industry in Bangladesh and the proposed future.

The industry could be broadly grouped into two - viz. (i) Repackers and (ii) Formulators and repackers. There are about 6 formulators/packers and just over 20 repackers. The formulators essentially depend on the imports for their technical grades, and in the case of repackers all pesticides/formulations are of import origins. The total quantum of pesticides/formulations currently sold is about 5000 M.T. and is likely to double by 1995.

The packaging materials used by the industry is by far made indigenously except a select few.

There are quite a few multinationals in the field with considerable expansion programme including formulating a few within Bangladesh. Since the recent past, the indigenous industry has also come to the fore and most of them have drawn-up expansion programme.

The Pesticide Rules, 1985 (The Bangladesh Gazette - 16th November, 1985) and The Pesticides Ordinance, 1971 (as modified upto 30th June, 1984) indicates packaging, storage and labelling requirements.

The Bangladesh Standards and Testing Institute is responsible for evolving standards for all requirements. As for packaging materials and packages as well as testing and quality control only very limited input is available.

2.2 FACTORY VISITS

As many as eleven factories were visited during the period. Ten of these are engaged either in formulation and repacking or repacking only. The technical grade for formulation as well as formulated materials wherever repacking is concerned are all imported. Some of these have overseas collaboration. The exporters from overseas who send the materials in bulk generally follow the packaging systems as prescribed for dangerous goods. The eleventh unit visited manufacture mosquito coils with Chinese collaboration.

The Director, Plant Protection Wing or other counterpart staff accompanied the Consultant during all these visits.

The major aspects discussed with officials of the units visited, counterpart staff and points of observations were:

- 2.2.1 Product range and Product mix
- 2.2.2 Sources of supply and quantities (level)
- 2.2.3 Types of packaging materials and packages used and the capacities of unit packs
- 2.2.4 Types of bulk packs used and packaging systems
- 2.2.5 Packaging line layout, method of packaging
- 2.2.6 Types of machine used - manual, mechanical, semi-automatic and automatic
- 2.2.7 Inplant storage and material handling
- 2.2.8 Distribution system, type and extent of damages and problems experienced
- 2.2.9 Specifications for packaging materials and components and packages and the quality control system adopted and facilities available.
- 2.2.10 Other related factors with regard to packaging aspects

Detailed reports are made in respect of all the pesticide/formulation plants visited. These reports are annexed. (ANNEXURE - IV to ANNEXURE - XIV).

At the end of each report, under the sub-head "OBSERVATIONS" a series of points are elaborated which should serve as guide lines to the respective unit to bring about improvements, to overcome some of the lacunas as well as for future planning in their material procurement, storage, quality control, packaging line layout and mechanisation.

In as much as the units visited adequately represent the total industry set-up (for pesticides) in the country, the observations made on various aspects should be equally applicable to the industry as a whole.

It is seen that the packaging aspects have not received the complete attention and emphasis needed and therefore the guidelines worked out should form the basis.

2.3 TECHNICAL SESSIONS

A series of technical/practical oriented sessions were conducted for the benefit of the counterpart staff. These mainly covered:

- 2.3.1 Packaging principles and concepts
- 2.3.2 Package development factors
- 2.3.3 Packaging materials and containers - primary and ancillary
- 2.3.4 Package conversion techniques
- 2.3.5 Packaging materials and containers - properties and relevance, and Identification

Besides, the various observations made during the factory visits were taken-up for discussion and emphasis laid on some of the major aspects, the Plant Protection Personnel should consider during clearance of a package for a particular pesticide. The relevant properties and tests to be carried out were also discussed.

A demonstration with brief discussion on the samples including some new concepts, brought by the Consultant, was also held with the counterpart staff.

Some of the packaging materials collected during the factory visits were taken-up for testing of some basic properties, and comparative evaluation. The test results were discussed and the variations observed were highlighted with specific reference to their effect of quality maintenance of the product. Methods of identification of plastics films, measurement of thickness, separation of substrates in a laminate also were covered during practical discussion sessions.

2.4 WORKSHOP ON PACKAGING

As part of the work programme, a 3-day Workshop on Packaging with special emphasis on packaging pesticides was conducted, at the Conference Room of the Plant Protection Wing. The Workshop was inaugurated by Mr S. Islam, Director General, Department of Agricultural Extension. About 25 delegates from the pesticide industry and personnel from the plant protection wing attended the Workshop.

The broad spectrum of subjects covered during the three days are:

- 2.4.1 Packaging Concepts. Factors influencing package selection and design. Influence/Effect of environmental conditions on packaging materials and packages. Appropriate storage and preservation needs.

2.4.2 An overview of packaging of pesticides. New trends and shifts. Specific references to alternates available and their comparative merits. Importance of appropriate marking.

2.4.3 Packaging materials and package - testing and quality control, specifications for packaging materials and packages. Packaging cost and packaging economics.

During the Workshop sessions a large number and types of package materials and packages as well as new concepts were displayed and taken-up for detailed discussions. Besides the currently used package types by the pesticides industry in Bangladesh were also taken-up for discussions alongwith modifications and improvements that could be considered. The Workshop sessions were conducted with the help of transparencies and slides.

Brief notes/points covered during the sessions appear in ANNEXURES - XV, XVI and XVII.

2.5 PESTICIDE ASSOCIATION OF BANGLADESH (PAB) MEETING

A meeting was organised by P A B between the members of the Association, the personnel of the Plant Protection Wing and the Consultant. This was a half day meeting and held at the Metropolitan Chamber of Commerce and Industry Building.

The members were addressed by the Consultant on his finding during factory visits and discussions with various industry personnel. The major points highlighted are:

- 2.5.1 An immediate need to review the packaging materials and packages;
- 2.5.2 Drawing of complete specifications for the packaging materials and packages;
- 2.5.3 Consideration of alternate media/systems;
- 2.5.4 Importance of quality control of packaging materials and packages;
- 2.5.5 Streamlining of packaging operations; and
- 2.5.6 Evolving a code for approval of the package system for pesticides.

2.6 VISITS TO DEALERS AND RETAILERS

Visits to a select few dealers and retailers were undertaken at two centres viz. Narsingdi and Ghazipur. Whereas the visits were primarily aimed at to learn of the distribution of pesticides and obtain data on the performance of boxes and unit packs as well as type and extent of damages experienced, quite a few other information were also collected.

Some of the dealers also do retailing. The inventory normally is small and the inventory could be for 2-3 days to 3 months depending on the specific season and demand.

The two main seasons are November-February and September-October. The dealers get their consignments either as door delivery or collect by themselves. The retailers buy in smalls from the nearest dealers.

Specific observations made are at ANNEXURE - XVIII.

2.7 SPECIFICATION PARAMETERS FOR MATERIALS AND PACKAGES

It was observed that the pesticide industry has over the period of time evolved the packaging systems through their own resources and/or through the help of overseas collaborators and domestic packaging industry. Certain parameters are adopted for procurement of packages and components and within the limited facilities quality check done. But in order to ensure procurement and use of appropriate functional packages it is essential that adequate specification details in respect of all packaging materials, components and packages are drawn-up. Besides helping procurement, these details also would help the sources of supply as to the quality requirements and maintenance as well as the appropriate inspection of incoming materials and packages by the quality control department.

To facilitate the pesticide industry in the above, the various parameters to be covered in the drawing-up of specifications for the packaging materials, components and packages are listed and given in ANNEXURE - XIX. Taking typical cases of 50 ml glass bottle and corresponding ROPF

cap, 5 L HDPE jerry can with cap and a 3-ply CFB, the specification details are drawn and provided in the ANNEXURE.

In respect of glass bottle, ROPP cap, 5 L jerry can and tap the drawings are also made and appended to the ANNEXURE. These are also discussed during the Workshop. These should help to develop specifications for other materials and containers as well.

2.8 TESTING AND QUALITY CONTROL EQUIPMENT

ANNEXURE - XIX gives the quality parameters for various packaging materials, components, and packages. However, the use of these become redundant if they are not quality checked. Thus therefore there is a need for quality control testing equipment. Based on the current systems of packaging, the equipment(s) needed are identified and provided in the ANNEXURE - XX. ANNEXURE - XXI, gives a list of major sources of supply of these equipment.

2.9 GUIDELINES FOR EVALUATION OF PACKAGING SYSTEM FOR PESTICIDES AND/OR THEIR FORMULATIONS

The packaging system in respect of every pesticide/ formulation should be appropriately developed in a scientific manner following a set-out guideline. This should include product package compatibility, shelf-life evaluation and package performance. Once these tests are carried out and found successful indicating the acceptability of the packaging

system then the specification details in respect of each package components become the essentialities and to be strictly followed. In this manner, the packaging details for all products could be arrived at.

In the absence of a guideline procedure, currently either the industry or the concerned authorities are unable to pinpoint the specifications. With a view to overcome this and assist the industry, a guideline procedure for assessing the adequacy of a packaging system is drawn-up and details given in ANNEXURE - XXII.

2.10 CONCLUSIONS

2.10.1 The pesticide industry in Bangladesh has a turnover of about 50 crore (500 million) Takas (14 million US \$) per annum with about 5 formulators/packers and just over 20 repackers.

2.10.2 Thirty percent of above account for imports. Thus all formulators and repackers essentially depend on imports.

2.10.3 Considering the trend, the demand is expected to double by 1995. Quite a few of the existing industry expects to expand and go in for formulation.

- 2.10.4 The solid pesticides are packed in HDPE bags, paper bags or plastics laminated bags. Liquid pesticides are mostly packed in amber coloured glass bottles and a smaller quantity in HDPE and aluminium bottles. Economical factors play a significant role in the selection of the packaging media.
- 2.10.5 The bulk packaging system invariably is a corrugated fibre board box.
- 2.10.6 Most of the packaging line operations are manual with very little mechanisation or automation.
- 2.10.7 The packaging material and package handling are also manual. The storage system is conventional to pallets.
- 2.10.8 The consignments are generally distributed by road, and the channel consists of warehouse - dealer/whole seller - retailer.
- 2.10.9 The inventory carried by the distributors is not high. The dealers either collect their requirements from Company warehouses or gets door delivery. Retailers buy their requirements from the nearest dealers.

- 2.10.10 Specifications for packaging materials, components and packages are limited and not adequately exhaustive. Hence the limitation on quality control.
- 2.10.11 No set guideline is available to decide on the packaging system and hence for approval.
- 2.10.12 The above conclusions clearly indicate considerable scope for improvements, considerations of alternates, streamlining the storage, package line operations, warehousing, development of specifications, quality control facility establishment, education and training in the field of packaging, preparation of a code of practice to establish the adequacy of a package system for a pesticide product etc.

3. RECOMMENDATIONS

3.1 A study of the packaging system adopted by the cross section of the industry reveal manual - mechanical to semi-automatic system. There is considerable scope to streamline the operations in the packaging line and mechanise by simple machines to improve the packaging system, reduce product contact and increase package efficacy.

3.2 A variety of packaging materials are used. However, the specifications followed for the packaging materials and packages are not detailed enough. Although some basic parameters are used, the performance parameters are conspicuously absent. It is therefore necessary to update the specifications in respect of all packaging materials, components and packages.

The various parameters that should be included in drawing-up the specifications are identified and included in the report. Typical specifications with drawings in respect of selected materials and packages are also provided. (Ref. ANNEXURE - XIX).

3.3 The absence of adequate specification details obviously constraints the quality inspection of the incoming materials and finished packages. Therefore only limited tests, basically visual are possible. In line with updating of the specifi-

cations, minimum quality control facilities should also be established. The equipments needed for the same and the sources of supply of such equipment are provided in ANNEXURE - XX, and ANNEXURE - XXI, respectively.

- 3.4 In quite a few of the factories visited it is observed that the storage of materials, packing operations and storage of finished goods packages are all in the same premises. Further, in some instances the ground is also not concreted.

Primarily the inventory areas and packing section should be segregated. The floor area of the production/packing, storage/warehouses should be fully concreted.

- 3.5 Storage of packaging materials and finished goods packages should not be (stored) direct on ground. Dunnage materials like jute/hessian, paper boards, bamboo should be avoided. The store/warehouse area should be provided with wooden pallets as dunnage. The wood used should be seasoned and treated. Over a period of time, storage racks should be introduced.

- 3.6 The materials movement within the factories and for loading and unloading is invariably manual. Simple mechanical handling devices should be introduced. This could be of the type hand operated trucks, trolleys, mechanical conveyors, etc.

3.7 Specific observations are made in respect of each of the visits undertaken and discussions held. It is envisaged that most of these would be applicable to the industry as a whole. These observations could therefore be taken up for discussions with the concerned units as well as collectively to effect immediate short term improvements and long term planning. (Ref. ANNEXURES - IV to XIV) and (ANNEXURE - XVIII).

3.8 In the existing pesticide rules it is indicated that details of packaging and labels should be furnished to the Director. Details of labelling, coding, etc. required to be covered are also indicated.

This needs however to be reviewed in the context of the earlier recommendation to upgrade/update the packaging materials/package specifications and quality control.

While applying for product registration, it should also be made mandatory on the part of firm seeking the registration to furnish complete details of all packaging and components with the drawings and specifications with tests carried out and results.

3.9 To implement above a scheme is drawn-up and appended (ANNEXURE - XXII).

As could be seen this scheme essentially covers:

Shelf-life and compatibility evaluation

Laboratory analysis of packaging materials

Transportworthiness of finished packages (Lab.)

Performance assessment of packages in field

All the trials should be with actual product and proposed packages (imported or indigenous) and specifications.

3.10 Once the trials are completed and product/packages considered acceptable, then a National Standard (BDS) should be made for all future reference and adherence as well as monitoring.

3.11 The list of national standards as are readily available should be prepared with specific reference to materials and packages used by the pesticide industry and those likely to be used in the near future. The immediate task would be to update these or prepare standards exclusively to meet pesticides packaging. Wherever no standards are made this also should be taken up on a priority basis.

The above calls for a close liaison between the packaging material and package manufacturers, pesticides industry, the plant protection wing and Bangladesh Standards and Testing Institute besides transport and warehousing organisations.

3.12 A national committee should be set-up in the above context. This technical committee headed by the Plant Protection Wing would receive the reports from the pesticide manufacturers, scrutinise the same and on being satisfied would clear the packaging system.

3.13 In the existing system the Plant Protection Wing is responsible for clearance of the packaging system. Within the limited facilities available and based on the information provided by the industry and some market data, a decision is taken.

Considering the importance of the subject and product nature, a more indepth approach would be essential. Towards this the laboratory facilities at the Plant Protection Wing need to be augmented with the requisite packaging materials - components - unit and bulk package testing equipments besides facilities for shelf-life evaluation, compatibility studies, chemical analysis, etc.

3.14 The personnel of the Plant Protection Wing should also be given indepth training in the field of packaging.

3.15 An extensive study of the packaging industry set-up in Bangladesh is also of immediate importance to identify the future growth and expansion needs as well as immediate modernisation needed to cater to the pesticide packaging needs.

3.16 The laboratory set-up at Plant Protection Wing,
the training of their officials overseas and packaging
industry study could be an extension of the project or
new project assistance sought through appropriate agencies.

ANNEXURE - I

JOB DESCRIPTION

(ACTIVITIES)

1. Discussions on the set-up of the pesticide industry.
2. Survey and assessment of the existing systems of storage and packaging of pesticides by the pesticide industry and suggest specific measures for improvements.
3. Conduct a series of technical sessions on "packaging" for the counterpart laboratory staff of Plant Protection Wing.
4. Conduct workshops on packaging covering packaging concepts, packaging materials and containers - shifts and trends, Effect on climatic conditions on packaging materials, packaging of pesticide products, packaging materials and package testing and quality control.
5. Suggest the actions to be taken and guidelines for streamlining appropriate packaging standards for pesticides.
6. Submission of a report outlining the activities undertaken, observations made alongwith recommendations.

ANNEXURE - II

WORK PLAN

- 24.07.1990 : Briefing (New Delhi)
- 25.07.1990 : In transit: Delhi - Calcutta - Dhaka
- 26.07.1990 : Visit UNDP, Dhaka. Discussion with Mr. A.W. Sissingh, UNIDO Country Director and Mr Mazharul Haq, Director, Plant Protection Wing
Visit DAE Meet counterpart staff
- 27.07.1990 : Holiday
- 28.07.1990 : Orientation at Plant Protection Wing. DAE
- 29.07.1990 : Discussions with counterpart staff
- 30.07.1990 : Visit to Rhone - Poulenc Bangladesh Limited
- 31.07.1990 : Leave Dhaka - Arrive Chittagong
Visit to Chittagong Port and discussions
Visit to Jamuna Oil Company, Chittagong
- 01.08.1990 : Visit to Padma Oil Company Limited, Chittagong
Visit to Ciba-Geigy Agrochemicals Division
- 02.08.1990 : Leave Chittagong, Arrive Dhaka
- 03.08.1990 : Holiday
- 04.08.1990 : Visit to Shetu Pesticides Limited

- 05.08.1990 : Visit to Shetu Corporation Limited
Visit to Data Enterprises Limited
Visit to Beximco Agrochemicals Limited
Visit to The limit Agroproducts Limited
- 06.08.1990 : Visit to I.C.I. Agrochemicals
- 07.08.1990) Technical sessions on packaging - for
)
08.08.1990) Plant Protection Wing, counterpart staff
)
09.08.1990) Discussions with counterpart staff on
) findings during plant visits
- 10.08.1990 : Holiday
- 11.08.1990 : Meeting with members of Pesticide Associa-
tion of Bangladesh. Presentation of findings
and recommendations
- 12.08.1990 : Visit to Pesticide dealers' shops. Narsingdi
- 13.08.1990 : Visit to Pesticide dealers' shops. Gazipur
and Visit to Entomology & Plant Pathology -
Department of B.R.R.I., Gazipur
- 14.08.1990) Orientation Lectures for Plant Protection
)
) and industry personnel on: packaging,
15.08.1990)
) packaging materials and containers, packaging
)
16.08.1990) handling and distribution and packaging
)
) materials and package - Testing, quality
)
) control, Inspection and discussions

- 17.08.1990 : Holiday
- 18.08.1990 : Preparation of report
- 19.08.1990 : Preparation of report
- 20.08.1990 : Discussion with Director - Plant Protection
Wing and UNIDO Country Director
Meet Director General - DAE
- 21.08.1990 : Depart Dhaka, Arrive Calcutta
Leave Calcutta, Arrive Delhi
- 22.08.1990 : Debriefing at UNIDO, New Delhi
and Ranpap, New Delhi
Leave Delhi - Arrive Bombay

ANNEXURE - III

PERSONNEL MET

1. Mr.-M. Islam
UNIDO SECTION U.N.D.P., New Delhi
2. Dr S. P. Dhua
Regional Co-ordinator Regional Network on Pesticides for
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Entomologist Plant Protection Wing
8. Mr. Md. Mahbub-ur-Rahman
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Chemist Plant Protection Wing
9. Mr. Afigur Rahman Khan
Chemist Plant Protection Wing
10. Mr. Tarun Ranjan Sarkar
Plant Protection Wing
11. Mr. M. H. Khan
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Tongi, Gazipur
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(Area Chemical Manager))
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)
16. Mr. A. M. Ziaul Hoque)
(Terminal Manager))
)
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17. Mr. M. P. Sen)
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18. Mr. Mahidur Rahman)
(Operations Manager))
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19. Mr. Kamaluddin)
(Operations Supervisor))
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37. Mr. A. K. Majumdar)
(Marketing Manager))
)
38. Mr. Siraj A. Chowdhury)
(Technical Manager))
)
)
39. Dr Syed Akhter Hossain)
(Quality Control Manager)))
)
) I.C.I. Agrochemicals,
40. Mr. Sardar Iftexharuddin)
Ahmed) I.C.I. Bangladesh Manufacturers Limited,
(Manager-Engg. &) P. O. Box. 48,
Productivity) Water Works Road,
) Narayanganj, 1400
) Bangladesh
)
41. Mr. Samaresh Sur)
(Production Manager))
)
)
42. Mr. Ashraf Saleheen)
(Site Manager))
)
43. Mr. Nazim Uddin Ahmed) Plant Protection Extension Office,
S.M.O.) Narsingdi
44. Retailer) M/s. Zibon Kumar Modak
Narsingdi Bazar, Narsingdi
45. Wholeseller/Retailer) M/s. Abbas Mio, Narsingdi Bazar,
Narsingdi
46. Retailer) M/s. Abdul Hannar, Narsingdi Bazar,
Narsingdi
47. Retailer) M/s. Milan Bhuya, Narsingdi Bazar,
Narsingdi

48. Whole Sale/Dealer M/s. Shanaz Traders
49. Mr. T. Hossain) Agricultural Extension Field Office,
Deputy Director) Ghazipur
)
)
50. Ms. Zeenat; S.M.S.)
)
51. Retailer/Dealer M/s. Kazi Traders, Ghazipur
52. Retailer M/s. Abdul Ali & Company, Ghazipur
53. Mr. Manzoor Hossain M/s. Cock Brand Mosquito Coils Company
Deputy Managing Limited, Teknagpar,
Director Jaidevpur
54. Dr Islam)
Managing Director)
)
)
55. Dr. Karim)
Head, Entomology) Bangladesh Rice Research Institute,
Department) (B.R.R.I.), Ghazipur
)
)
56. Dr. Shahjahan)
Head, Pathology)
Department)
)
57. Mr Nasiruddin Ahmed)
(Deputy Collector))
)
)
58. Mr. Feroz Shah Alum) Customs,
(Assistant Collector)) Chittagong
)
)
59. Mr. M. A. Jalil)
(Principal Appraiser))

ANNEXURE - IV

FACTORY VISIT

- FACTORY : RHONE - POULENC, TONGI, GAZIPUR
- PERSONNEL MET : Md. AMIRUL ISLAM (Agrochemical Manager)
M. ANSAR ALI (Works Manager)
M. A. MATIN (Chemical Production Manager)
- DETAILS : The firm is engaged both in pesticide formulation and repacking. The annual production is of the order of 600 tonnes. The input materials are imported from Switzerland, Denmark, etc. As many as 13 products are marketed by the firm.

PRODUCTS

SOLIDS

Ecolar 5G (granules)
Diethene M 45)
Salin)
Macquiprax) (powders)
Rovreal)
Thiovit)

LIQUIDS

Anthione
Ecolax - EC
Kalthene
240 Amine
Planofix
Zethiol
Zolone
Ronister

Of these products, Diethene M-45, which is imported in 25 kg bulk packs is repacked.

PACKAGING

A. SOLIDS

The solids are packed in quantities of 50 gm, 100 gm, 500 gm, 1 kg and 2 kg. The unit pouch (bag) is fed manually to automatic filler and passed on through a conveyor to a rotary sealing machine. The filled bags are flattened and predetermined number of bags packed in corrugated board boxes, closed, labelled and made ready for despatch.

B. LIQUIDS

The liquid pesticides are packed in glass bottles in quantities of 50 ml, 100 ml and 400 ml. The bottles are fed manually to the autofill machine, plug inserted and ROPP cap fitted on. The label is then affixed and predesired number of bottles packed in corrugated board box, labelled and made ready for despatch.

PRODUCT	QUANTITY UNIT PACK	UNIT PACK DETAILS	NO.OF UNIT PACKS/BULK PACK AND MODE OF PLACEMENT	BULK PACK DETAILS
DIETHENE - M 45	1 kg	12 micron Polyester/ 12 micron Aluminium/ foil/10 micron LDPE	10 2 x 1 x 5	3-ply, RSC, one piece printed CFB box with top and bottom 3-ply CFB liners and two, 5-ply CFB shells
	500 gm	- do -	20 2 x 2 x 5	- do - but 4, 5-ply shells
	100 gm	- do -	40 2 x 2 x 10	- do -
	OTHER SOLIDS	2 kg	Printed 0.1 mm opaque HDPE placed inside 0.06 mm HDPE bag	5(1 x 1 x 5)
	1 kg	- do -	10(2 x 1 x 5)	-do- with two shells
	500 gm	- do -	20(2 x 2 x 5)	-do- with four shells
	100 gm	- do -	40(2 x 2 x 10)	-do- with four shells
	50 gm	- do -	40(2 x 2 x 10)	-do- with four shells
ALL LIQUIDS	50 ml	Amber colour glass bottle with neck finish for 25 mm ROPP cap. Poly- propylene plug	30 6 x 5 x 1	3-ply, RSC, one piece printed box, with 3-ply CFB honey comb (slotted) partition
	100 ml	- do -	25 5 x 5 x 1	- do -
	400 ml	- do -	6 3 x 2 x 1	- do -

LABELLING

The inner HDPE bags for solids are printed with the requisite details and additional information required are stamped.

The paper labels used for glass bottles and outer CFB boxes are also printed as per regulatory needs. The CFB boxes are also pasted outside with label. The preprinted, adhesive backed labels are moistened manually before affixing to the bottles and CFB boxes.

CFB BOXES - ERECTION AND CLOSURE

The CFB boxes are erected and closed using pressure sensitive plastic tape and applied in 'C' manner.

SPECIFICATION AND QUALITY CONTROL

The thickness and dimensions are specified in respect of HDPE bags and aluminium foil laminate bag. In respect of the tape and label the gsm and dimensions and print details are specified. The specifications for CFB boxes and components include grammage of paper and dimensions. As for glass bottles, the colour and neck finish to suit the ROPP form the specifications. For the plug, the material indicated is polypropylene.

DISTRIBUTION

The products are mainly distributed by road and through dealers who undertake redistribution in smalls.

OBSERVATIONS

- (i) For solid pesticides other than Dithene M 45, an inner HDPE and outer HDPE bag is used. It is inferred that the outer bag is used to protect the print on the inner bag as the print tends to rub off. The rubbing off the print is either due to the poor quality of the ink or due to non-treating of the print surface. The bags should be treated by flame or corona discharge before printing.
- (ii) Instead of two poly bags, a laminate of BOPP/Poly or polyester/poly could be used, with reverse printing the details.
- (iii) In the case of aluminium foil laminate pouch for Dithene, alternate combinations like polyester/metallised polyester/PE or metallised polyester/HDPE/LDPE combinations could be tried.
- (iv) In all above cases the thickness of the materials should be finalised only after actual shelf-life evaluation.
- (v) The specifications for the pouch materials should also be updated to include quality, peel and heat seal strength, tensile and tear resistance, water vapour transmission rate besides thickness.

- (vi) Similarly in the case of glass bottles drawing with complete details should be developed and the neck finish details should correspond to ROPP cap specifications. Some of the important factors are weight, wall thickness, verticality, etc.
- (vii) Whereas the size and grammage are specified for the tape and label, the adhesive properties and certain physical parameters also need to be specified.
- (viii) The tape is drawn or unwound from the roll and cut to apply on the CFB boxes. Quite often they break in between and as a result more pieces are used resulting in waste and non-uniform taping. Use of hand operated gum-tape dispenser would be more effective and economical.
- (ix) Similarly the labels are applied with adhesive coating manually. It is desirable to use a pregummed label and preferably pressure sensitive label.
- (x) The quality of the CFB boxes and components needs to be looked into. Air pockets and finger lines are observed besides being wet or soggy nature. These could be overcome by improving the manufacturing practice. Grammage alone is not the quality parameter. Grammage of plies, Cobb value, bursting strength of board, compression strength of box are some of the major parameters that help to maintain the quality and performance of the box.

- (xi) Presently a 3-ply CFB box with 5-ply shells are used. Probably a well designed adequately strong 5-ply CFB box would be adequate. The design of the CFB box also could be of the type of auto-slotted box to get self made partitions.
- (xii) In the formation of the shells, the stitching pin ends face inwards. This could damage the pouches.
- (xiii) Instead of using a complete top and bottom sheet/liner only a smaller sheet to level the flap surface might be adequate.
- (xiv) The unit and bulk packs also should be assessed for their performance through transportworthiness tests.
- (xv) In the 100 ml bottle bulk pack it is noticed that almost 3 cm void is available at top. This could result in free movement of the bottles during handling and transport, leading to possible leakage and breakage. The dimensions should be reworked which could also give cost benefit.

ANNEXURE - V

FACTORY VISIT

- FACTORY : JAMUNA REPACKING PLANT, CHITTAGONG
- PERSONNEL MET : MR SYED IFZAL AHMED (Area Chemical Manager)
MR A. M. ZIAUL HOQUE (Terminal Manager)
MR M. P. SEN (Shipping Manager)
MR MAHIDUR REHMAN (Operations Manager)
MR KAMALUDDIN (Operations Supervisor)
- DETAILS : The firm essentially is a repacking and marketing unit. The products are imported in 200 L drums from FMC, USA and repacked in smaller unit packs.
- PRODUCTS : LIQUIDS: Marshell, Ethiane, Penthriond
- PACKAGING : The unit pack in all cases is amber coloured glass bottles, with ROPP cap. The 200 L drum is moved to the volumetric filling line. In the first station the bottles are fed manually to the filling nozzle. The caps are fed manually and capped in the capping machine and filled and capped bottles are carried on tray to another table for labelling and bulk packing.

PRODUCT	QUANTITY PER PACK	UNIT PACK DETAILS	NO.OF UNITS/ BULK AND MODE OF PLACEMENT	BULK PACK DETAILS
MARSHELL	50 ml	Amber colour glass bottles with 25 mm PP neck finish	24 (6 x 4 x 1)	3-ply CFB, one piece, RSC type box with top and bottom 3-ply plate and 3-ply CFB slotted honey comb partition
	100 ml	- do -	- do -	- do -
ETHIANE	100 ml	- do -	- do -	- do -
PENTHRIOD	50 ml	- do -	- do -	- do -

LABELLING

The preprinted labels are stamped with additional information like date of manufacture, date of expiry and moistened manually and applied on to the bottle. A preprinted larger size label is also pasted onto the CFB bulk pack.

CFB BOXES - ERECTION AND CLOSURE

The boxes are erected and closed using gummed paper, tape, placed in a 'C' manner.

SPECIFICATION AND QUALITY CONTROL

The following specifications are adopted:

1. GLASS BOTTLE

Capacity	50 ml	100 ml
Brimful capacity	65 ± 3 ml	110 ± 4 ml
Height	93.5 ± 1 mm	113.5 ± 1.5 mm
Diameter	39.5 ± 1 mm	48.18 ± 1 mm
Neck finish	25 mm ROPP cap	25 mm ROPP cap

2. ROPP CAP .25 mm, Silver aluminium colour, with printing

3. LABEL

Material	Phenyl lacquer coated art paper	Phenyl lacquer coated art paper
Dimension	12.3 x 5.6 cm	14.5 x 6.4 cm
Grammage	85 gsm	85 gsm
Print	As provided	As provided

4. CORRUGATED BOARD BOX

Internal dimension	26 x 18.4 x 10.8 cm	31 x 21.8 x 13.2 cm
Grammage	150/130/150	150/130/150
Style	RSC	RSC

DISTRIBUTION

The CFB filled and closed boxes are moved by road by Company's enclosed van to distribution points.

OBSERVATIONS

- (i) The glass bottles are filled and the filler quantity is measured with measuring cylinder. A level checking system could be introduced immediately after the filling line so that a cent percent check is possible.
- (ii) The total filling, checking, capping, labelling and coding operations could be streamlined in a horizontal line suitably connected through conveyors. This would reduce product-package handling and improve productivity.

- (iii) A cap feed head could be introduced to avoid manual capping.
- (iv) Similarly a label feeding, gumming/moistening, and labelling head could also be introduced. Instead of gummed labels pressure sensitive labels could be considered.
- (v) Although some specifications are drawn-up for the packaging materials and components, these need to be updated and minimum quality control facilities built-up.
- (vi) Besides other printing the CFB boxes are printed externally also with a glass bottle indicating breakage and in red colour. It is said that this symbol stands to indicate poison and fragility. This pictorial illustration should be reviewed as a broken glass could connote different meaning.
- (vii) The number of bottles packed per outer CFB pack could be increased to enable to reduce per unit packaging cost.
- (viii) Use of a gum tape dispenser would help uniform wetting and better tape adhesion and hence better closure of the CFB box. Alternatively a pressure sensitive PVC or BOPP tape could be used.

ANNEXURE - VI

FACTORY VISIT

FACTORY : PADMA OIL COMPANY LIMITED, CHITTAGONG

PERSONNEL MET : MR FAIZULLAH (Chemicals Manager)
MR SYED FAZLUL HAQUE (Secretary and
Finance Manager)

MR ROB (Plant Engineer)

MR M. AZMAL HOSSAIN (Country Manager,
FMC International SA, Dhaka)

DETAILS : The firm has started with the overseas
collaboration - FMC International SA.
They import techni-grade material (solids)
and formulate and pack for distribution.
Besides FMC, they also import from Shell,
Mitsubishi and Nordice Alkali. The annual
production is of the order of 1500 tonnes
(Furedon), 60 tonnes (liquid pesticides)
and 35 tonnes of MIPC powder.

PRODUCTS

Granules

Furedon

Liquids

Cipermethin

Monocrotophos

Dicrotophos

Dialdrin

(205 L drums)

Powder

MIPC - 75 pct

(205 L drums)

PACKAGING

The Furedon technical grade is suitably formulated and packed in smaller quantities of 500 gm, 1 kg and 2 kg in automatic weigh filler. Each bag is check weighed and closed by heat sealing. These are printed HDPE bags. Desired numbers of such bags are further packed in outer CFB boxes with 5-ply CFB sleeves and top and bottom 3-ply CFB plates. Each vertical layer is also separated from the adjacent one with a 3-ply CFB sheet.

The liquid pesticides are packed in glass bottles of capacities 50 ml, 100 ml, 200 ml and 400 ml. The units are bulk packed in solid board boxes with solid board top and bottom plates and solid board slotted partitions.

MIPC - 75 pcT powder is packed in unit quantities of 100 gm, 500 gm, 1000 gm and 2000 gm. The packing material used is printed HDPE bags and heat sealed after filling. The unit bags are placed in a large size polypropylene bag which in turn is packed in a solid fibre board box, glued and taped for despatch.

Labels are affixed to the bottles as well as onto the outer CFB/SFB boxes.

PRODUCT	QUANTITY PER PACK	UNIT PACK DETAILS	NO.OF UNITS/ BULK AND MODE OF PLACEMENT	BULK PACK DETAILS
FUREDON	500 gm	Printed, 0.12 mm HDPE bag, heat sealed	20 (2 x 2 x 5)	Printed, 3-ply, RSC one piece, CFB box, with top and bottom 3-PLY CFB plate, 2, 5-ply 'L' shaped sleeves, and 3-ply CFB partition
	1 kg	- do -	10 (2 x 1 x 5)	-do- but only one 3-ply CFB partition
	2 kg	- do -	5 (1 x 1 x 5)	-do- but no 3-ply CFB partition
MIPC 75 PCT	100 gm	Printed 0.12 mm HDPE bag heat sealed	24	Placed in PP bag and then in a solid board box, closed by gluing and taping
	500 gm	- do -	20	- do -
	1000 gm	- do -	10	- do -
	2000 gm	- do -	5	- do -
LIQUIDS	50 ml	Amber colour, 25 mm ROPP neck finish glass bottle	24 (6 x 4 x 1)	1 piece, printed, solid fibre board RSC type box with top and bottom solid board plate and solid board slotted partition. Box closed with adhesive and tape.
	100 ml	- do -	24 (6 x 4 x 1)	- do -
	200 ml	- do -	18 (6 x 3 x 1)	- do -
	400 ml	- do -	12 (4 x 3 x 1)	- do -

Also Furedon 20 kg is packed in LDPE laminated jute (Hessian) bag with loose HDPE liner bag with double machine stitching. The hessian bag is stencilled with details. A label placed in LDPE bag is also stitched to the bag.

LABELLING

The labelling operation is manual. The pregummed label is applied around the bottles as well as the outer CFB/solid board boxes.

CFB/SFB BOX - ERECTION AND CLOSURE

The boxes are erected and closed by application of gum in between the flaps and also by application of paper tape placed in 'C' manner. The paper tape is also pregummed on line.

SPECIFICATION AND QUALITY CONTROL

Various parameters currently used as part of specifications for the packaging materials and components are:

- (i) CFB/SFB BOXES: Ply, Grammage, Adhesive (Sodium Silicate)
Surface Coating - for water resistance and dimensions
- (ii) HDPE bags: Material(grade), gauge and print details
- (iii) Glass bottles: Colour, size and neck finish
- (iv) Labels: Grammage, size, quality and printing
- (v) Tape: Type, size and gsm
- (vi) Hessian laminated poly sack: Adhoc purchase

The purchases are normally effected by a committee who compares the originals and the competitive supplies. In the case of HDPE bag, the thickness is checked. But for these, no quality control facilities for packaging materials and packages are available.

DISTRIBUTION

The inplant handling is manual and mechanical. The packages are normally stored in clean and ventilated store house with wooden pallet dunnage.

The distribution is generally by trucks and through Company warehouses and dealers.

PACKAGE ANNUAL CONSUMPTION

The approximate annual consumption of some of the major package types are as below:

CFB/SFB Boxes	:	2,00,000
HDPE bag	:	1.5 Millions
Glass bottles	:	8,00,000

OBSERVATIONS

1. FUREDON GRANULE PACKING LINE

- (i) The granules are filled through an autofiller with the bags being fed manually. The filled bags are manually check weighed and weight adjusted. An auto bag feeder and auto check weigher could be introduced to reduce tolerances and improve productivity.
- (ii) The filled and sealed bags are flattened and pressed, to remove air and facilitate further packing. The bag used being a barrier it is not possible to remove air. Further immediately after sealing if pressure

is applied it would affect the seal and hence performance of the bag. The bags after sealing should be adequately cooled. The length of the conveyor could be increased to allow the bags to travel adequately.

- (iii) It is informed that the print on the poly bags often gets smudged or rubbed off. This is mainly due to either inadequate treating or non-treatment of the basic poly bag before printing. The bag surface should be heat treated to obtain a better adhesion. The treatment level recommended is 40-42 dynes.
- (iv) The filled and sealed poly bags are packed in a CFB box. The bags are heavily pressed to accommodate in the box and flaps closed. The carton size appears less and the process of pressing leading to tearing and damage to the CFB box. It is informed that as the granules would settle down with time and to avoid void a smaller size box is used. But in the present process the CFB box already gets damaged in the beginning itself, and hence will not perform satisfactorily during distribution.
- (v) The packing of the poly bags in the CFB boxes could be done on a vibrator to help settling down of the product and ease in closure and to avoid damaging the CFB boxes. Alternatively, after placing the poly bags, the CFB box could be vibrated and then closed.

- (vi) The size of the HDPE bags could be slightly reduced.
- (vii) The CFB boxes are erected and closed by gluing the flaps and again by a paper tape glued separately. If a proper closure is made by gluing the taping could be avoided. Instead of using a glue, hot melt adhesive with hot melt gun could be more effectively used.
- (viii) The in-line gluing of the tape should be avoided and pregummed tape with gum tape dispenser should be used. A pressure sensitive tape is preferred. This would help to reduce the number of operations in the packaging line and improve productivity.
- (ix) Although some specifications are followed for the CFB boxes, and components, the overall quality observed appears to be weaker and hence need to be reviewed.
- (x) At present a 3-ply CFB box, with 5-ply sleeve, and middle 3-ply partition is used. The whole concept could be designed on the following lines:
 - (a) Use a continuous sheet to form the liner and partition which would make the box stronger.
 - (b) Use a 5-ply box and avoid inner components.

(c) Redesign the CFB box with 5-ply board and use an auto-slotted box.

(d) The complete top and bottom liner in the present design also could be avoided and only a sheet to cover the gap between the flaps used.

2. MIPC POWDER PACKING LINE

- (i) Observations made in the case of Furedon packaging - line operations, HDPE bag closure, bulk pack erection and closure, style of box are equally applicable in this case also.
- (ii) The HDPE bags are first packed in a polypropylene bag. The size of the bag is much larger than required and hence could be reduced to save cost. The bag is not closed. It could be either twist tied or twisted and clipped. Instead of using a tubular bag, a gusseted bag should be preferred to place the HDPE bags more uniformly, better distribution with the outer bulk box, and this would probably help to reduce the size of the solid board box.
- (iii) The reasons for using a solid board box need to be re-examined and probably a 5-ply CFB box could be standardised. An auto-slotted type of box design would be helpful.

3. LIQUID PACKAGING LINE

- (i) The liquid filling line could further be streamlined by introducing a feeder table for the glass bottles, a check weigher, an automatic labeller and coder/maker. The filler and capper are already available. However, a cap feeding head also should be introduced.
- (ii) Presently, the labels are gummed and applied to the glass bottles. Pregummed labels or pressure sensitive labels should be used with a labelling machine.
- (iii) The method of erection and closure of the solid board boxes is to be modified on the lines discussed earlier for CFB boxes for Furedon granules.
- (iv) The bulk packaging medium used is a solid board box with top and bottom solid board plates and solid board slotted partitions. Primarily the pack should provide adequate cushion and shock absorbancy for the glass bottles are fragile. The pack also should provide adequate stack load performance. Considering these, a CFB box should be more effective. A 5-ply CFB box with board and narrow flute combinations should be desirable.
- (v) Glass being fragile, heavy, possible alternates like aluminium bottles and co-extruded bottles of plastics could be considered.

- (vi) Instead of labelling the glass bottles, they could also be printed by the ACL process. This would help to reduce the possible reuse of the containers.

4. OTHERS

- (i) Though some parameters are followed as specifications for the packaging materials and packages, these are to be updated to include certain critical properties which are related to the ultimate performance of the bags, labels, CFB/SFB boxes, gum tape etc. Specifying such properties also will help the quality inspection system easier.
- (ii) The acceptance of the packaging materials and packages is by and large by the evaluation by a committee and against competitive supplies. Notwithstanding the merits of this, adequate laboratory facilities should be built-up.
- (iii) Furedon 20 kg is bulk packed in poly laminated jute bag with inner HDPE loose liner. After filling both inner liner and outer bag are stitched together. The printing and marking on the outer bag also is not very legible.

It is suggested to twist tie or heat seal the inner loose liner bag separately.

Considering extreme variations in climatic conditions and most being highly humid, it might be desirable to use a HDPE woven fabric with LDPE lamination due to their better weather resistance and possibility of better legible marking and printing.

- (iv) In so far the gluing of labels, and tape is to be continued, till adopting the modifications suggested, a simple roller coater could be used instead of hand brushing. Also a PVA based glue could be used.

ANNEXURE - VII

FACTORY VISIT

FACTORY : CIBA GEIGY, AGRICULTURAL DIVISION, CHITTAGONG

PERSONNEL MET : MR C. F. IMAM (Manager, Quality Control)
MR FERHAD MANZUR (Production Manager)

DETAILS : The firm has overseas collaboration with M/s. CIBA GEIGY. They import technical materials from Switzerland, formulate in this plant for domestic distribution. The approximate tonnage marketed is 2300 MT (solids) and 1,60,000 MT of liquids. Recently they have also ventured into rodenticide and Neoron 500 EC for tea.

PRODUCTS

SOLIDS

Basudin 10 GR
Miral 3 GR
Lanirat

LIQUIDS

Dimecron 100 SGW
Nogos 100 EC
Diazinon 60 EC
Nuvacron 40 SL

PACKAGING

Basudin is packed in quantities of 500 gm, 1 kg and 2 kg in polyamide/polyethylene laminate bags/pouches (imported) using auto filler and heat sealed. Predetermined number of filled pouches are packed in outer CFB boxes, with top/bottom 3-ply CFB plates, and 5-ply CFB sleeve.

Miral is packed only in 1 kg packs. The system is similar to that adopted for Basudin.

Nogos, Nuvacron, Dimecron are packed in HDPE bottles (125 ml and 500 ml), and Diazinon is packed in glass bottles (50 ml, 125 ml) and Neoron in 450 ml glass bottles. Nuvacron, the new product also would be packed in glass bottles (450 ml).

The HDPE bottles are produced in-factory and also printed. The caps are also produced within the factory. Preprinted PS labels are affixed to the HDPE bottles and pouches, providing additional information required. The glass bottles are labelled using PVA gum. The outer CFB boxes are provided with two labels.

Automatic filler and capping machines are used for both HDPE and glass bottles.

PRODUCT	QUANTITY PER PACK	UNIT PACK DETAILS	NO.OF UNITS/ BULK AND MODE OF PLACEMENT	BULK PACK DETAILS
BASUDIN	500 gm	PA/PA/PE, 0.6 mm bag, heat sealed	20 2 x 1 x 10	3-ply, RSC, one piece, CFB box, with top and bottom 3-ply CFB plate, and two 5-ply 'U' shaped sleeve and one honeycomb 3-ply CFB partition
	1 kg	- do -	10 2 x 1 x 5	-do- but, instead of honeycomb partition only one 3-ply CFB middle plate
	2 kg	- do -	5 1 x 1 x 5	-do-, without middle plate or partition
MIRAL	1 kg	- do -	10 2 x 1 x 5	-do-, with one 3-ply CFB middle plate
DIMECRON	125 ml	HDPE bottle, with HDPE pilferproof cap. Printed and labelled. Printed leaflet attached with rubber band	20 5 x 4 x 1	3-ply RSC, one piece CFB box, with top/bottom 3-ply CFB plate, and one honeycomb 3-ply CFB partition
	500 ml	- do -	10 5 x 2 x 1	- do -
DIAZINON	125 ml	Amber coloured glass bottle, labelled with 25 mm ROPP cap	20 5 x 4 x 1	3-ply, 1 piece, RSC CFB box, with 3-ply CFB top/bottom plate and one 3-ply CFB honeycomb partition
	125 ml	- do -	24 4 x 6 x 1	3-ply, 1 piece, RSC CFB box with 4 sleeves of 3-ply CFB, 4, 3-ply honeycomb partitions and 8-top/bottom 3-ply plates

	50 ml	Amber coloured glass bottle, labelled with 25 mm ROPP cap	50	5-ply, 1 piece, RSC, CFB box with one 3-ply CFB honeycomb partition and top/bottom, 3-ply CFB plates
LANIRAT BAIT	100 gm	Printed HDPE bag heat sealed	40	5-ply, 1 piece, RSC, CFB box, with 3-ply CFB top/bottom plates and one honeycomb partition of 3-ply CFB

LABELLING

The pouches and HDPE bottles are preprinted and provided with a pressure sensitive label. The glass bottle is labelled with PVA glue. The outer CFB boxes are provided with printed labels, one on each side and glued with PVA glue.

CFB - BOXES - ERECTION AND CLOSURE

The boxes are erected and closed using 2½ inch wide gummed paper tape, moistened manually.

SPECIFICATIONS AND QUALITY CONTROL

Specific grades for manufacture of HDPE bottles and caps are imported from WEstern Europe. The moulds are also imported.

For CFB boxes the external dimensions are grammage of paper and type of paper are specified. The pouch material specifications are as per supply source and dimensions are specified. Weight of CFB cartons, and tolerance limits for grammage, size, weight, and type of glue are also mentioned. Type of paper and grammage besides print details are specified for label stock.

Based on above some quality control check are made on the incoming materials, besides weight, dimensional aspects, visual defects as well as on line performance. However, no detailed facilities are available in the laboratories. It is also informed that the bulk CFB boxes are tested through drop and inclined impact tests.

DISTRIBUTION

The consignments are generally moved by full truck load by road. These are first sent to the eight warehouses in the major districts. From there the products are moved to stockists to dealers and retailers.

The handling and storage of the finished goods packs are facilitated by using post pallets including fork lift trucks and other hand operated mechanical devices. The plant and storage are found to be clean and tidy.

OBSERVATIONS

1. BASUDIN GRANULE PACKAGING LINE

- (i) The bags after filling and sealing are manually flattened for removal of air. The bag used being a barrier it is not easy to remove the air. Further application of pressure immediately after sealing is likely to affect the seal leading to poor performance of the bag. The bags after sealing should be adequately cooled and if necessary the conveyor length increased.

- (ii) It is informed that the bags are pressed to remove air, spread the product and facilitate packaging in CFB outer boxes. This could be done under vibration which would help to settle down the product.
- (iii) It is desirable to check as to whether such pressing would affect the product forming dust.
- (iv) The bags when packed in the CFB box remain above the top level and there is a tendency to place the top 3-ply CFB sheet and again to enable to close the flaps. This leads to bulging of the carton at the sides and often tearing at corners which would affect the ultimate performance of the CFB boxes. As indicated above packing under vibratory conditions should be helpful.
- (v) The top flaps and bottom flaps are closed using 2½" gummed paper tape. The tapes are moistened manually and hence possibility of non-uniform wetting and erasure of gum. Use of a gum tape dispenser should help overcome these problems.
- (vi) It is also noticed that the top flaps when closed do not meet at the centre which could be due to bulging of the box. This should be rectified to achieve better performance from the box.

(vii) The CFB boxes are made with manufacturers joint using staple pins. The distance between the two adjoining pins should not be more than 2.5 cm and the top and bottom pins should be nearer the ends.

(viii) It is informed that the specifications for the CFB boxes also say that the top surface should have a waterproof coating. This should be ascertained by a water absorbancy test.

2. LANIRAT PACKAGING LINE

The observations made with regard to above on gauge, sealing and CFB boxes should be considered in this case also.

3. LIQUID FILLING LINE

A. PLASTICS BOTTLES

- (i) The caps are placed manually and the system could be improved by introducing a cap feeding.
- (ii) The printed bottles are also provided with a PS label which could also be made on inline process alongwith a marker.

- (iii) After the bottle is filled and capped a leaflet is attached and held with a rubber band. The chances of the rubber band slipping and leaflet becoming loose could not be overruled. The system can be improved by using a shrink sleeve or a fix-a-form label.
- (iv) The observations made on CFB boxes, closure system etc. in the earlier case should also be reviewed in liquid packing line.
- (v) The outer CFB box is also provided with a printed label and manually gummed and pasted. The application of adhesive could be mechanised by a simple roller mechanism or replaced by pressure sensitive label.

B. GLASS BOTTLES

Most of the observations above are applicable in this case as well.

4. OTHERS

- (i) Besides printing and labelling a PS label also is attached to the unit packs. The line personnel peels the label from the backing material and holds to the table surface for quite some time. This exposure to atmosphere will affect the adhesive quality due to drying. Immediately after removal from the backing material, the label should be affixed.

Alternative the labels instead of obtaining as individual piece could be obtained in a reel form and dispenser-cum-labeller used.

- (ii) The plastics bottles are made and printed in-house. The treatment level should be checked as a regular measure.
- (iii) Though specifications are drawn-up for various packaging materials and components, these need to be updated to include some critical physical/mechanical, physico-chemical and performance parameters.

ANNEXURE - VIII

FACTORY VISIT

FACTORY : SHETU PESTICIDES, JADURCHAR, SAVAR

PERSONNEL MET : MR M. S. HUDA (Managing Director)
MR R. K. DAS (General Manager)
Md. SADIQUAL ISLAM (Quality Control and
Production In-charge)

DETAILS : They are engaged both in formulation and re-
packing. Melathion, Diazinon 14G, Sumithion
are formulations. Carbofuran 3G, Dimethioate
40EC, Malathion 57EC, and Phosphomedon 100SL
are repacked. The import sources include
USA, Japan, Denmark, Indonesia and Taiwan.

PRODUCTS :

LIQUIDS

Malethion
Sumithion 50 EC
Dimethioate 40 EC
Phosphomedon 100 SL

SOLIDS

Diazinon 14 G
Carbofuron 3 G

PACKAGING

The liquids are packed in amber coloured glass bottles in
capacities of 50 ml, 100 ml and 400 ml with 25 mm ROPP cans provided
with cork/PE or board/PE wads. The bottles are labelled, marked and
distributed in outer CFB boxes.

The solids (granules) are packed either in printed HDPE pouches or labelled paper bag with outer HDPE pouch.

The unit quantities are 500 gm and 1 kg.

PRODUCT	QUANTITY PER PACK	UNIT PACK DETAILS	NO.OF UNITS/ BULK AND MODE OF PLACEMENT	BULK PACK DETAILS
CARBO- FURAN	500 gm	Printed HDPE bag heat sealed	20 2 x 1 x 10	3-ply, one piece, RSC CFB box, with top/bottom and middle vertical 3-ply plate and 3-ply 'C' CFB sleeves
	1 kg	- do -	10 2 x 1 x 5	- do -
DIAZINON	500 gm	Paper bag one each label on either side adhesive closed and placed in PE bag and heat sealed. (Proposed to be re- placed by polyamide/ PE laminated pouch)	20 2 x 1 x 10	- do -
	1 kg	- do -	10 2 x 1 x 5	- do -
MALA- THON	50 ml	Amber colour glass bottle, wrap around label, stamped with 25 mm ROPP cap	24 6 x 4 x 1	Printed, 3-ply, CFB, RSC, 1 piece box with 3-ply CFB top/bottom plate and 3-ply honey- comb partition
	100 ml	- do -	24 6 x 4 x 1	- do -
	400 ml	- do - 28 mm ROPP cap	12 4 x 3 x 1	- do -
SUMITHION	50 & 100 ml			
DIME- THIOATE	50, 100, 400 ml	-----system similar to Malathion above-----		
PHOSPHO- MEDON	100 ml			

LABELLING

The HDPE bag is preprinted and stamped with additional information. The paper bag is provided one each printed label on either side, and stamped with expiry date, manufacturing date and batch No. The labels for glass bottles are gummed at either ends and manually labels and additional information labelled. The outer boxes are also labelled after manually gumming.

CFB BOXES - ERECTION AND CLOSURE

This is done by using 2½ inch paper tape or pressure sensitive cello tape.

SPECIFICATION AND QUALITY CONTROL

Whereas no detailed specifications are drawn-up certain parameters like paper grammage, paper type and grammage for labels, plies and weight of CFB boxes, weight of ROPP caps and print details are used. Within these areas, quality control is done.

OBSERVATIONS

A. LIQUID PACKAGING LINE

(i) The labels are gummed manually and only at two ends and applied manually. Pregummed labels or pressure sensitive labels could be considered. A simple labeller and coder/marker could be introduced in-line.

- (ii) It is observed that the bottle surface is dusty and hence would affect the labelling. The surface should be cleaned dry before application of label.
- (iii) The CFB boxes are erected and closed either by using a 2½ inch paper tape or cello tape. The paper tape is also kept after gumming for sometime which would not give a proper labelling. A pregummed label or a PVC/BOPP pressure sensitive tape of 2 inch is desirable and a hand operated dispenser should be used.
- (iv) The CFB boxes are printed in two colours (eg. green and black) with necessary information and Arrow marking. One colour printing might be adequate and help save cost. To indicate the fragility of the product inside, the wine glass symbol should also be printed.
- (v) The bottles instead of being brought in basket and dumped at feeding point, should be brought in a tray and used directly to avoid chipping, label scratches, etc.
- (vi) The labels at the filling point are still found to be wet which could lead to their peeling off, marring, tearing, etc. and hence should be adequately dried before filling operation.

- (vii) After filling the bottles should be moved and kept upside down to check for leakage.
- (viii) The quality of the CFB boxes need to be reviewed and improved. The manufacturer's joint for the CFB boxes is achieved by staple pin. The positioning and number of staples should be as per standard to obtain a better construction.

B. GRANULE PACKAGING LINE

- (i) The Furedon granule is unloaded from HDPE bags into drums and filled manually into bags. The bag is kept on balance, weight adjusted and sealed. The line operation should be improved by using a hopper, autofiller, check weigher and heat sealer.
- (ii) After sealing the bags are pressed to flatten which could affect the seal and hence after sealing, adequately should be cooled.
- (iii) The erection of CFB boxes and closure should be done with gummed paper tape or PVC/BOPP tape using hand operated dispenser.
- (iv) The HDPE bags with the CFB boxes could be kept on a vibrator to enable the granules to settle down and facilitate ease in packing.

- (v) The 3-ply sleeve and middle partition could be made from one piece to achieve better strength.
- (vi) The direction of flute of the CFB box, sleeve and partition should be vertical to achieve better compression load performance.
- (vii) Instead of the 3-ply box and sleeves and partitions a 3-ply or 5-ply CFB autoslotted style carton could be considered which would give a stronger and more functional box besides productivity.
- (viii) It is observed that after filling the pouches, there is a gap at top. This would result in sagging of the box while in stack and damage to CFB boxes. The dimensions should be worked out appropriate.
- (ix) The quality of the CFB boxes, partitions and plates, gum tape Vs PVC/BOPP tape and use of dispenser etc. should be on the lines observed earlier.
- (x) In respect of diazinon, it is informed that the present pack is likely to be replaced by polyamide/PE laminated pouch. The following could be considered.
 - (a) A printed paper bag with PE coating inside. This would reduce packing operations and would be a better barrier. Based on shelf-life need, the need for outer PE bag to be decided.

(b) While switching over to polyamide/PE other alternatives like polyester/HD/LD or BOPP/HD/LD or co-extruded film combinations could be tried. In the case of laminates a reverse printing is possible and desirable.

4. OTHERS

- (i) In the pallet of CFB boxes it is observed that in quite a few cases the boxes on top are caved inwards and along the bottom a bulg line is formed. These are due to gap/void in the box and inadequate compression strength.
- (ii) In some cases the gum tape has lifted due to inappropriate adhering and hence affects the box closure system.
- (iii) Some of the boxes are found wet due to high humidity and poor water resistance of the paper.
- (iv) For loading of boxes into the truck, the boxes are carried individually consuming considerable amount of time. A hand operated trolley to move the complete pallet at the loading point should be used to augment the operation and save time.
- (v) Specification details for all packaging materials and components need to be updated and minimum quality control facilities established.

ANNEXURE - IX

FACTORY VISIT

FACTORY : M/S. SHETU CORPORATION LIMITED, DHAKA

PERSONNEL MET : MR MAINUL ISLAM CHOUDHURY (Manager, Development)

DETAILS : This is essentially a repacking unit. They import granules, powders and liquids from USA, Japan, Denmark, FRG, Holland, Singapore and Pakistan. The approximate quantities repacked and marketed are 500 MT of granules, 10 MT of powder and 2,00,000 lit. of liquids, per annum.

PRODUCTS

<u>LIQUIDS</u>	<u>GRANULES</u>	<u>POWDERS</u>
Sumithion 50 EC (Fenithrothion)	Sunfuran 3 G (Carbofuran)	Carbaryl 85 WP (Carbaryl)
Sumicidine 20 EC (Fenvelate)		
Fyfanon 57 EC (Malathion)	Diazinon 14 G (Diazinon)	
Roxion 40 EC (Dimethoate)		
Denkavepon 100 EC (DDVP)		
Uniflow sulfur (Sulfur)		
Manex II (Mancozeb)		

PACKAGING

The liquids are packed in amber coloured, labelled glass bottles in capacities of 50 ml, 100 ml, 400 ml and 500 ml, with 25 mm/28 mm ROPP cap with outer CFB box.

Granules are packed in 500 gm and 1 kg in 0.12 mm thick printed HD poly bags and heat sealed with CFB boxes as outer bulk packs. Powder is packed in printed HDPE bags in 50 gm and 100 gm with outer CFB boxes.

The CFB boxes printed are provided with two labels:

UNIT QUANTITY PACKS/NO. PER BULK PACKS AND MODE OF PLACEMENT

Sumithion	50 EC	:	24x50 ml (6x4x1)	24x100 ml (6x4x1)	12x500 ml (4x3x1)
Sumicidine	20 EC	:	20x50 ml (5x4x1)	10x100 ml (5x2x1)	
Fyfanon	57 EC	:	24x50 ml (6x4x1)	24x100 ml (6x4x1)	12x400 ml (4x3x1)
Roxion	40 EC	:	24x50 ml (6x4x1)	24x100 ml (6x4x1)	12x500 ml (4x3x1)
Denkavepon	100 EC	:	20x50 ml (5x4x1)	24x100 ml (6x4x1)	
Uniflow Sulfur		:		24x100 ml (6x4x1)	12x400 ml (4x3x1)
Manex II		:		24x100 ml (6x4x1)	12x400 ml (4x3x1)
Sunfarun	3 G	:	20 x ½ kg (2 x 10 x 1)	10 x 1 kg (2 x 5 x 1)	
Diazinon	14 G	:	20 x ½ kg (2 x 10 x 1)	10 x 1 kg (2 x 5 x 1)	
Carbaryl	85 WP	:	40 x 50 gm (7x4x1) (6x2x1)	25 x 100 gm (1x13x1) (1x12x1)	

UNIT PACK	UNIT PACK DETAILS	NO. OF UNIT PACKS/BULK	BULK PACK DETAILS
50 ml	Amber colour glass bottle labelled with ROPP cap	20 or 24	3-ply printed, 1 piece, RSC type box with 3-ply CFB top/bottom plate and honey comb partition
100 ml	- do -	10 or 24	- do -
400 ml/ 500 ml	- do -	12	- do -
500 gm granule	0.12 mm thick, HDPE printed, heat sealed bag with inner unprinted HDPE bag, heat sealed	20	3-ply printed, 1 piece, RSC type box, with top/bottom and middle 3-ply CFB partition and two labels
1 kg	- do - (In the case of diazinon only one printed HDPE bag is used)	10	- do -
Powder 50 gm	Printed HDPE bag, heat sealed, 0.12 mm thick film	40	3-ply, CFB, printed, 1 piece, RSC box, with 3-ply top/bottom plate and slotted honey comb 3-ply partition. (Of 6 columns and 2 columns respectively).

LABELLING

The printed poly bags are stamped with additional information. The glass bottles are labelled which are adhesive coated at the ends. The labels for outer CFB boxes are also separately adhesive coated and labels affixed. All these are manual operation.

CFB BOXES - ERECTION AND CLOSURE

The CFB boxes are erected and closed with 2 inch wide gum paper tape, moistened manually and placed in a 'C' manner.

SPECIFICATION AND QUALITY CONTROL

The specifications currently used include gauge and size of HDPE bags, ply and dimensions of CFB boxes, volume of glass bottles and type of paper and weight for labels. The quality control on these materials are also restricted to visual observations and print details.

DISTRIBUTION

The distribution is normally by road through dealers and stockists. For storage of filled boxes dunnage made from bamboo are used. The incoming materials, repacking as well as finished goods are stored in the place. The ground is not concreted.

Factory ----- 4 Ware Houses 200 distributors
Retailers

All movements are by road. Either own or hired trucks are used.

The market complaints reported include leakage of liquids, breakage of glass bottles and tearing and smudging of labels, etc.

OBSERVATIONS

- (i) The floor area is not concreted and hence is a source for dust and dirt. It is necessary to cement concrete the floor.
- (ii) The bottles are received in gunny bags and CFB boxes in kraft paper wrap. These are also stored direct on ground. Suitable dunnage should be used for storage of material and the place need to be made clean.
- (iii) The bottles from the gunny bags are collected in bamboo baskets and moved to the bottle filling line. Either a plastic or metal tray should be used. Further the bottles should be cleaned of its surface to facilitate proper labelling.
- (iv) The paper labels are applied with gum at two ends and bottle rolled over for labelling purpose. Pregummed labels or pressure sensitive labels with a labeller would be preferable.
- (v) The CFB boxes are erected and closed using 2 inch wide gummed paper tape after manually moistening. It is desirable to use a gum tape dispenser to obtain uniform wetting and to avoid removal of adhesive. A pressure sensitive BOPP/PVC tape with hand dispenser would be better.

- (vi) The CFB boxes are printed with details and an arrow mark. Wherever the boxes are used for glass bottles, the boxes should also be printed with an illustration of a "wine glass" to depict product fragility.
- (vii) For labelling of the CFB labels, a pregummed label or preferably a PS label could be used.
- (viii) A skull + some illustration is also printed on the CFB box but in black. This has to be in red.
- (ix) The granules and powders are filled manually and weight checked on balance, followed by heat sealing of the bags by hand heat sealer. The line should be streamlined and mechanised to reduce manual operations and product contact. An autofiller, check weigher, rotary sealer should be installed in-line.
- (x) The print on the poly bags is found to have rubbed off. This is either due to a poor quality of ink or print or inadequate treatment of the poly surface before printing. The poly surface should be adequately heat treated by corona or flame to a level of about 40-42 dynes to obtain a better and long lasting print.

- (xi) In the CFB boxes, the pouches are placed vertically with CFB, 3-ply partitions and there is a gap of about 3 cm on top. It is desirable to place the pouches flat (for eg. 40 pouches placed as 2 x 2 x 10 with a slotted partition of giving four columns). The dimensions of the boxes also should be appropriately worked out to avoid void in the box which otherwise would affect the performance of the box.

- (xii) In case of some bags, the sides are printed in two colours. If it is not to satisfy any regulatory measure, the print could be in one colour to save cost.

- (xiii) The CFB boxes are stored on dunnage assembled with bamboos. The surface is not uniform and intermittantly convex and gaps exist. Uniform pattern of storage is therefore not possible. The bottom layer boxes tend to take contours of the bamboo shapes and get damaged.

ANNEXURE - X

FACTORY VISIT

- FACTORY : DATA ENTERPRISES LIMITED, KAKRAIL, DHAKA
- PERSONNEL MET : MR MAGFUR UDDIN AHAMED (Managing Director)
MR A. SALAM (General Manager)
MR SHAMSUL HUDA TALUKDER (General Manager,
P & B Division)
- DETAILS : Currently the firm is essentially involved
in repacking of imported products. The pro-
ducts include granules, powder, and liquids.
The imports are from France and Japan. The
annual quantum of repacking done is 350 MT
(granules), 15 MT (powders), and 50 MT (liquids).

PRODUCTS

<u>GRANULES</u>	<u>POWDER</u>	<u>LIQUIDS</u>	
DIAZINON	PADAN 50% SP	DIAZINON	60% EC
PADAN 10%		DECIS	2.5% EC
		BASSA	50% EC
		TREBON	10% EC
		ELSAN	50% EC

PACKAGING

Liquids are packed in amber coloured glass bottles in quantities of 25 ml, 50 ml, 100 ml and 200 ml and 400 ml. The first three have a major share whereas 200 ml and 400 ml constitute less than one percent. The outer box is a 3-ply, CFB box with top and bottom 3-ply CFB plates and 3-ply CFB honey comb partitions. The bottles as well as CFB boxes are provided with labels, gummed separately.

Granules are packed in 250 gm, 750 gm and 1 kg in paper bag with one side labelled and stamped and outer HDPE bag heat sealed, using solder rod. The paper bag is closed by gum. The outer box is a 3-ply CFB box, labelled with two 3-ply sleeves. The boxes are erected and closed with 2 inch wide tape.

Powders are packed in 25 gm, 50 gm and 100 gm quantities with two PE bags and one paper bag. The PE bags are heat sealed and paper bags closed with gum. Paper bag is labelled and stamped. The CFB outer packing system is similar to that used for granules.

Most of the operations are manual.

PRODUCT	QUANTITY PER UNIT PACK	UNIT PACK DETAILS	NO.OF UNITS/ BULK AND MODE OF PLACEMENT	BULK PACK DETAILS
GRANULE	250 gm	Labelled kraft paper bag, filled and pasted about PE bag heat sealed	40 4 x 2 x 5	3-ply, 1 piece, 2 piece, labelled, RSC type box with two 3-ply CFB sleeves, and closed with gum tape
	750 gm	- do -	12 2 x 1 x 6	- do -
	1 kg	- do -	10 2 x 1 x 5	- do -
POWDER	25 gm	LDPE bag in LDPE bag heat sealed and outer labelled paper bag, gum closed	200 2 x 2 x 50	- do -
	50 gm	- do -	200 (4, 3-ply CFB pack each containing 50 pouches)	Four 3-ply CFB packs in one outer 3-ply CFB pack and closed with gum tape
	100 gm	- do -	100 2 x 2 x 25	Similar to 25 gm packing
LIQUID	25 ml	Amber coloured glass bottle, labelled with ROPP cap		3-ply, RSC type, 2 piece, one side labelled CFB box with 3-ply CFB top and bottom plate and honey comb partition
	50 ml	- do -		- do -
	100 ml	- do -		- do -

LABELLING

The paper bags are obtained labelled one side and stamped in-house with additional details. Glass bottles are labelled with application of gum in-house. The labels are pregummed in-house and affixed to the CFB boxes.

CFB BOXES - ERECTION AND CLOSURE

The tapes are first gummed and then applied on the CFB boxes in 'C' manner for erection as well as closure of the boxes.

SPECIFICATION AND QUALITY CONTROL

It is informed that certain basic parameters are drawn-up for procurement of packaging material and packages. But however, except for visual inspection and print details no other quality inspection is carried out.

DISTRIBUTION

FACTORY	<u>BY</u>	20-25 REGIONAL DIST. CENTRES	<u>BY ROAD</u>	EXCLUSIVE
	ROAD		OWN/HIRED VEHICLES	DEALERS
	(FULL TRUCKS)			(15)

(Stockist/Retailers Collect) RETAILERS/STOCKIST

The packing materials and packages are stored on pallets with raised brick platforms. The ground is not concreted. The storage, warehousing and packing operations are all done in the same area.

It is reported that though no major problems are experienced, sometimes spillage of granules (1-2%), leakage (0.5%) are reported. All material and package handling are manual.

OBSERVATIONS

A. GRANULE PACKING LINE

- (i) For unit pack of diazinon a kraft paper bag labelled with outer poly bag is used. The paper bag is gum sealed and poly bag heat sealed using a solder rod.

A laminated and printed paper bag could be considered. With poly lamination the bag could be heat sealed. This would help to avoid double bagging and gum closure. Use of other laminates like BOPP/Poly or Polyester poly printed with FFS machine would be more effective and productive. Till such time volume of operation justify a filling machine followed by rotary sealer should suffice the purpose.

- (ii) The poly bags after heat sealing are flattened. This would affect the heat seal, unless adequately cooled.

- (iii) The outer poly bag is heat sealed using a solder rod. This should be replaced by atleast a foot or erated band heat sealer.
- (iv) The filled unit bags are placed in a CFB box. In quite a few cases it is observed that the top level of bags is above the height of the box and hence a tendency to press down to effect closure of the box. This could damage both the bags and box.
- (v) The CFB box is made from 2 pieces. Considering the dimensions it should be a one piece box.
- (vi) The CFB box has a pair 'C' type 3-ply CFB sleeve. The ends of the sleeves do not meet. Further the flute direction of these sleeves is horizontal. Both these render no support. The sleeve should be a one piece construction and flute should be verticle.
- (vii) Instead of a 3-ply box with 3-ply sleeve, a 5-ply construction could be tried. Wherever a honey comb partition is used an autoslotted box design could be more effective.
- (viii) For erection and closure of the CFB box a 2 inch wide tape gummed with PVA glue is used. A pregummed tape preferably a PVC/BOPP pressure sensitive tape with tape dispenser would be more effective and productive.
- (ix) The gummed paper label for the CFB box also could be replaced by PS label.

B. POWDER PACKING LINE

- (i) The unit pack consists of two poly bags and a paper bag. This could be replaced by one poly bag and one paper/poly bag or other plastic film laminates as observed for granule packaging.
- (ii) The powder filling mechanisation also on the lines suggested earlier.
- (iii) The observations with regard to bag sealing, CFB box/sleeves, gum tapes, labelling etc. as made from granule packaging hold good in powder packaging as well.

C. LIQUID PACKING LINE

- (i) The bottles are labelled with gum. A pressure sensitive label with labelling machine could be more helpful.
- (ii) The line operation of bottle feeding, filling, capping, check weighing, labelling, coding/marketing could be horizontally streamlined and mechanised.
- (iii) The CFB boxes are made of 2 pieces, with flute direction - horizontal. The flutes in the honeycomb partitions are also horizontal. The total construction appears weak. Primarily the flutes should run vertically in both cases.

- (iv) It is also seen that the board has already cracked and split along the horizontal creases. This is due to weaker board and horizontal fluting.
- (v) Other observations with regard to style, closure, etc. as observed in earlier cases should be reviewed here as well for improvements.

D. OTHERS

- (i) It is desirable to segregate the material storage, packing line and finished good storage.
- (ii) The ground should be concreted to avoid dust/dirt contamination and moisture holding by ground.
- (iii) Some simple mechanical devices like gum tape dispensers, PS labels, coder/marker, band heat sealer should be introduced which would contribute to improved packaging.

ANNEXURE - XI

FACTORY VISIT

FACTORY : BEXIMCO AGROCHEMICALS LIMITED, DHAKA

PERSONNEL MET : MR SAEED AHMED (Factory in-Charge)
MR SYED SHAHIDUL ALAM (Marketing Operations Manager)

DETAILS : The firm currently repacks and markets locally a product mix consisting of about 14 products. The major among these are curaterr 3 G and 5 G, Lebaycid 50 EC, Dichlorvos 100 EC, Metasystox R 25 EC, Cupravit 50 WP and Round up. The annual repacking is 50 tonnes liquid, 600 M.T. granules and 40 M.T. powder.

PRODUCTS

<u>SOLIDS</u>	<u>QUANTITY/UNIT</u>	<u>UNIT/BULK CFB BOX</u>
Curaterr 5G/3G	2 kg, 1 kg, 500 gm	5, 10 and 20
Cupravit 50 WP	500 gm, 100 gm	12 and 45
Dipterex 80 SP	1 kg, 500 gm	10 and 50
2,4-D Sodium Salt	500 gm	9
Racumin	100 gm	35
Bayleton 25 WP	100 gm	35

LIQUIDS

Lebaycid 50 EC	450 ml, 100 ml, 50 ml	10, 24, 24
Dichlorovos 100	450 ml, 100 ml, 50 ml	10, 24, 24
Surcopur 360 EC	100 ml	24
Hinosan 50 EC	100 ml	24
Baycarb 500 EC	100 ml	24
Baythroid 050 EC	100 ml, 50 ml	24, 24
Round up	20 L, 4 L	1, 1

PACKAGING

The details specifically refer to curaterr 5 G, 1 kg pack and Baythroid 050 EC. It is however informed that the mode of packaging is similar to other granular/powder products and liquids and hence the observations are likely to hold good for the range.

The granule is unloaded from the imported HDPE woven bag and filled manually into a unprinted HDPE bag placed on a weighing scale, heat sealed and again packed in a printed HDPE bag heat sealed with inbuilt embossing. 10 x 1 kg bags are packed in a 5-ply, 1 piece, printed, labelled RSC type box with top and bottom 3-ply CFB liner plates. The bottom flaps are closed with adhesive and top flaps with paper tape. The pattern of placement of poly bag is $[(2 \times 2 \times 1) + (2 \times 1 \times 1) + (2 \times 2 \times 1)]$.

In case of liquid the bottle is labelled manually, after the bottle is first rolled over gum layer and label affixed. The bulk pack is a 3-ply, 2 piece, printed, RSC type CFB box, with top and bottom 3-ply CFB plate and mill board honeycomb partition. The box is provided with 2 paper labels.

LABELLING

The HDPE bags are preprinted. The labels for glass bottles are affixed with gum. The labels are pregummed and fixed to CFB boxes.

CFB BOXES - ERECTION AND CLOSURE

In the case of solids packaging the CFB boxes are erected with adhesive in-between flaps and closed with paper tape. In the case of bottles packaging, the boxes are erected and closed with PVC tape placed in 'C' manner.

SPECIFICATION AND QUALITY CONTROL

The specifications for packaging components currently used are 0.22 mm thick printed outer poly and 0.16 mm thick inner poly labels - 85 gsm art paper; plies of CFB box/plate and print details. The quality control check is mainly visual.

OBSERVATIONS

- (i) The line operations could be made more mechanised or automated to reduce manual handling by using auto-filler, check weight, band sealer, coder/marker etc. Possibly a FFS system could also be considered.
- (ii) Whereas it is understandable that two poly bags are used as a precautionary method possibly one stronger laminate or co-extruded film could be adequate.

- (iii) The placement of the filled bags in the CFB box should be reoriented to be more uniform. In the case of 10 bags a 2 x 1 x 5 pattern could be considered.
- (iv) The bags after placing in the CFB box are pressed for flattening which could harm the product, the heat seal and the CFB box. Often the bags' level is above the top level of the CFB box. Packing under vibration could help to overcome the problem.
- (v) The erection and closure of the CFB box should be made uniform and preferably done with pressure sensitive tape and using a tape dispenser.
- (vi) It is also noticed that the flaps of CFB boxes do not completely meet and close and hence should be rectified.
- (vii) Instead of using paper label with adhesive separately applied, a preprinted PS label should be considered.
- (viii) In the case of liquid packaging as well, the packing line operations could be better streamlined with simple mechanisation.
- (ix) The CFB box is made of 2 piece. Considering the dimensions the box should be made from one piece.
- (x) The honeycomb partition for glass bottles is made of mill/grey board considering the fragility nature, a CFB partition is more desirable.

- (xi) Other observations with regard to the box construction, taping, labelling etc. as observed are to be reviewed in glass packaging line also.
- (xii) The specification details for the packaging materials and packages need to be updated and essential quality control measures adopted.

ANNEXURE - XII

FACTORY VISIT

FACTORY : THE LIMIT AGROPRODUCTS LIMITED, DHAKA

PERSONNEL MET : DR FEZLUR RAHMAN KHAN (Managing Director)
MR SANKAR GOSWAMI (Manager - Operation)
MR A. K. MAJUNDER (Marketing Manager)

DETAILS : Presently this is a repacking unit - both granules and liquids. The products are imported from India and Italy. Solids repacked and marketed accounts for about 100 MT per annum.

PRODUCTS

SOLIDS

Diazinon 14 G

Carbofuran

Fenthioate

LIQUIDS

Malathion

DDVP

Fenithrothion

Dimethioate

Presently the liquid line is not in active operation.

PACKAGING

The liquid formulations received in 100L/200L drums are repacked in labelled, amber coloured glass bottles with ROPP caps in quantities of 50 ml, 100 ml, and 400 ml. The bulk pack is a CFB box.

The granular products are packed in quantities of 250 gm, 500 gm and 1 kg in printed/labelled paper bags with outer HDPE bags heat sealed and bulk packed in CFB boxes. All the operations are manual, though a mechanical filler is used at first stage of granule filling.

PRODUCT	QUANTITY PER PACK	UNIT PACK DETAILS	NO. OF UNITS/ BULK AND MODE OF PLACEMENT	BULK PACK DETAILS
GRANULE	250 gm	Printed/labelled paper bag, closed by gum with PE bag, heat sealed	40 2 x 2 x 10	3-ply CFB, 1 piece, RSC type box, with top/bottom CFB plate, and erected and closed by gummed paper tape. One label
	500 gm	- do -	20 2 x 2 x 5	- do -
	1000 gm	- do -	10 2 x 1 x 5	- do -

LABELLING

The paper bags are printed on one side and labelled on the other side and stamped with additional information. The glass bottles are labelled with gum and stamped. The CFB box is also provided with a printed paper label - gummed and affixed to cover one side and one end panel.

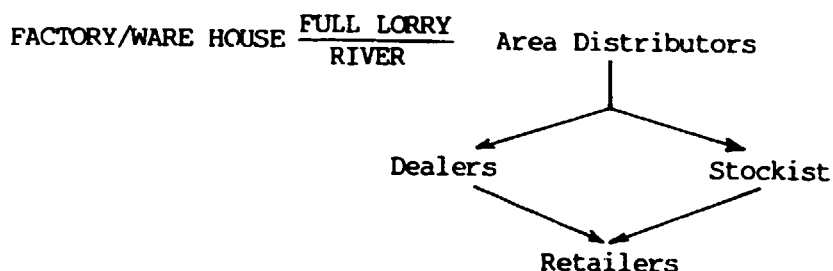
CFB BOX - ERECTION AND CLOSURE

The boxes are erected and closed using 2½ inch wide gummed paper tape placed in 'C' manner. The tape is moistened manually.

SPECIFICATION AND QUALITY CONTROL

No specifications are drawn-up and hence the absence of any quality control measures. The ply of CFB, the label print details are by far the details used.

DISTRIBUTION



OBSERVATIONS

- (i) The paper bag which is printed on one side and labelled on the other side could be printed on both sides. Instead of using a paper bag with outer PE bag a PE laminated paper bag or a plastic film laminate like polyester/poly or BOPP/poly could be used.
- (ii) The line operation could be mechanised with an auto-filler, check weigher, heat sealer, coder/marker or automated using a FFS machine.
- (iii) Presently for heat sealing of the poly bag a solder rod is used. This should be replaced by a foot operated band sealer.

- (iv) The bags after filling and sealing are flattened by pressing which could harm the product and affect the heat seal.
- (v) A small vibrator could be used to facilitate product settling and ease in closure of the CFB boxes.
- (vi) The gum tape is moistened manually for erection and closing of the CFB boxes. This could result in non-uniform wetting and removal of adhesive layer. A gum tape dispenser should be used. Pressure sensitive BOPP/PVC tape with hand dispenser might be more effective.
- (vii) The labels for the CFB boxes are gummed and affixed. Hereagain printed pressure sensitive labels could be more effective.
- (viii) It is observed that the boxes, plates, etc. are weak in construction and hence should be improved. It is also seen that the boxes are made from used imported boxes as witnessed from left over tapes and inner printed. This should be rectified.
- (ix) Specification details for all packaging components should be drawn-up and minimum quality control facilities established.
- (x) The storage space, packing line, and finished goods storage are desirably segregated and the floor area concreted. Appropriate pallet dunnage should be used for storage of materials and packages.

ANNEXURE - XIII

FACTORY VISIT

FACTORY : ICI BANGLADESH MANUFACTURERS LIMITED, NARAYANGANG

PERSONNEL MET : MR SIRAJ A. CHOWDHURY (Technical Manager)
DR SYED AKHTER HOSSAIN (Quality Control Manager)
MR SARDAR IFTEKHARUDDIN AHMED (Manager - Engg.
and Productivity)
MR SAMARESH SUR (Production Manager)
MR ASHRAF SALEHEEN (Site Manager)

DETAILS : Currently the firm is engaged in repacking of products imported from their parent organisation and marketing in domestic areas. The product range consists of Gramoxone 20%, Cymbush 10 EC, Actellic 50 EC, Pirimor 50 DP, Klerat block and Aerosol household insecticide. The quantities involved are of the order of 90,000 L, 25,000 L, 30,000 L, 20,000 x 50 gm bag (Trial) and a small order (trial) and 0.5 million cans respectively.

PRODUCTS

<u>LIQUID</u>	<u>POWDER</u>	<u>BLOCK</u>	<u>AEROSOL SPRAY</u>
Gramoxone 20%	Pirimor 50 DP	Klerat 0.005%	Household insecticide
Cymbush 10 EC		Wax Block	
Actellic 50 EC			

PACKAGING

Pirimor DP is packed in 25 gm, in poly bag, heat sealed and then placed in a tinplate container with printed wrap around paper label holding the lid and container together. 24 such units are packed in a 3-ply CFB box, closed with gum tape and labelled. This is a new product and being test marketed.

Klerat wax block also is a new market introduction packed 50 gm in PP/PE Co-extruded plastic pouch, heat sealed and 30 such unit packs bulk packed in an outer 3-ply CFB box, closed and labelled.

Gramoxone is packed in 5 Lit. HDPE Jerry Cans, and 200 Lit. HDPE liner drum with outer M. S. drum 4 x 5 Lit. jerry cans are further wooden crated.

Cymbush is packed in 50 ml, 100 ml, 200 ml, 450 ml amber colour glass bottle, with 25 mm/28 mm ROPP cap and art paper printed label. 30 x 50 ml, 24 x 100 ml, 12 x 200 ml, 6 x 450 ml bottles are bulk packed in 3-ply, one piece, printed and labelled, RSC type box with 3-ply CFB honeycomb partition.

16 Aerosols cans are packed per 3-ply, 1 piece, printed, RSC type box with 3-ply CFB honeycomb partition.

Actellic is packed in 50 ml and 100 ml glass bottles with bulk CFB box and 3-ply CFB partition. It is also marketed in 25 Lit. lacquered epoxy drum.

LABELLING

Art paper labelled are gummed and applied to the bottles. Labels are also gummed and affixed to CFB boxes and jerry cans and metal drums.

CFB BOX - ERECTION AND CLOSURE

Gummed paper tape moistened through mechanical roller are used for the purpose.

SPECIFICATION AND QUALITY CONTROL

In respect of glass bottles dimensions and neck finish and general appearance with drawing are specified.

For CFB boxes ply, dimensions, grammage are specified. Label is art paper stock of 85 gsm.

ROPP can details go with glass bottle neck finish.

Measurement of dimensions, general observations, weight and machine line performance constitute the quality control inspection. Firm is desirous of identifying additional performance parameters. Filled boxes are subjected to drop test.

OBSERVATIONS

- (i) Art paper labels are gummed and applied to the bottle manually. The operation could be mechanised and PS labels used.

- (ii) The complete line could be streamlined with bottle scrambler/feeder, filler, check, weigher, labeller, coder and marker.

- (iii) The CFB boxes are erected and closed with gummed paper tape. A BOPP/PVC based pressure sensitive tape with hand operated dispenser might be more useful and effective.

- (iv) The CFB boxes are also labelled. Hereagain a PS label could be used.

- (v) Though Pirimor is just introduced with PE bag and tinsplate container, various other cost effective packages could be considered.
 - (a) A composite container with label or shrink sleeve or shrink film.

 - (b) A thermoformed pack.

 - (c) A plastic container with print or label with shrink film or shrink sleeve.

(d) A stand-up pouch

(e) A lined carton

(b), (d) and (e) besides being economical, could not be reused as well and hence should be more purposeful.

(vi) Similarly for Klerat depending on market feed back alternate co-extruded films and laminates could be tried.

(vii) Specification details for all packaging components used need to be updated and minimum quality control facilities required should be established.

ANNEXURE - XIV

FACTORY VISIT

- FACTORY : COCK BRAND MOSQUITO COILS COMPANY LIMITED,
JAIDEVPUR
- PERSONNEL MET : MR MANZOOR HOSSAIN
- DETAILS : The firm manufactures mosquito coils with
Chinese collaboration, and distributes all
over Bangladesh.
- PACKAGING : A coil of two interlinked is packed in a 55
gsm printed paper envelope and ten (5 envelopes)
are packed in a telescopic type lid-tray paper
board carton. 60 such cartons are packed in
a 3-ply RSC type, 2 piece, printed CFB box,
erected and closed with gummed paper tape,
in 'C' fashion.

OBSERVATIONS

- (i) The paper envelopes could be replaced with HMHDPE bag. The
paper bag/HMHDPE bag should be closed.
- (ii) The paper board carton design could be changed to loxk bottom
top tuck-n-type or self locking type of box/carton.

- (iii) The print details should be reviewed and necessary amendment made. Inside paper envelope still gives an impression of an imported product with no details in Bangladesh.
- (iv) The gum tape is moistened with water manually and while fixing to the CFB box lot of water also goes on to the carton/box. This should be avoided by using a gum tape dispenser.
- (v) A change of paper envelope material and design of the carton should help reduce the package making operations and subsequently the productivity.

ANNEXURE - XV

PACKAGING ATTRIBUTES

1. THE PACKAGE MUST ATTRACT ATTENTION
2. THE PACKAGE MUST TELL THE PRODUCT STORY
3. THE PACKAGE MUST BUILD CONFIDENCE
4. THE PACKAGE MUST LOOK CLEAN AND SANITARY
5. THE PACKAGE MUST BE CONVENIENT TO HANDLE, TO
CARRY AND TO USE
6. THE PACKAGE MUST LOOK LIKE GOOD VALUE

PACKAGING

- A. A COORDINATED SYSTEM OF PREPARING GOODS FOR TRANS-
PORT, DISTRIBUTION, STORAGE, RETAILING AND END-USE
- B. A MEANS OF ENSURING SAFE DELIVERY TO THE ULTIMATE
CONSUMER IN SOUND CONDITION AT MINIMUM COST
- C. A TECHNO-ECONOMIC FUNCTION AIMED AT MINIMISING COSTS
OF DELIVERY WHILE MAXIMISING SALES (AND HENCE PROFITS)

THE CONCEPTS OF PACKAGING

- PACKAGING : IS HISTORICAL
- : NEW DEVELOPMENTS TO SUIT MODERN LIVING
- BUT BASIS STILL REMAIN SAME
- : IS THE LINK BETWEEN PRODUCTION -
- DISTRIBUTION - MARKETING
- : IS AN INDEX OF THE STANDARD OF LIVING

- PACKAGING ENTITIES : PRESERVE
- : PROTECT
- : PRESENT
- : PRICE
- : PROFIT

- PACKAGING STATUS : AS A MANAGEMENT FUNCTION
- : RELATED TO ALL OTHER MANAGEMENT FUNCTIONS
- : STARTS AT BLUE-PRINT STAGE OF PRODUCT DESIGN

- PACKAGE DEVELOPMENT : PRODUCT PROPERTIES

- FACTORS : PRODUCT SENSITIVITY
- : PACKAGING MATERIAL AVAILABILITY
- : PACKAGING MATERIAL PROPERTIES
- : PRODUCT PACKAGE COMPATIBILITY
- : STORAGE AND HANDLING FACILITIES
- : TRANSPORTATION MEANS
- : MARKETING PRACTICES AND ENVIRONMENT
- : COMPANY ATTITUDES

TRANSPORTATION : ROAD
: RAIL
: SEA
: AIR
: COMBINATION MODE (TRANSHIPMENTS)
: CONTAINERISATION

HAZARDS OF S, : MECHANICAL - HORIZONTAL & VERTICAL IMPACTS
H AND T : - SHOCKS AND VIBRATIONS
- STACKING
- PUNCTURES, TENSIONS, TORSIONS
- ABRASION, ROLLING AND DRAGGING
- PILFERING

CLIMATE - SNOW, LIQUID WATER AND MOISTURE
- SAND AND DUST
- SALT SPRAY
- GASES
- MICROBIALS
- HEAT

- PACKAGING LAWS : CONTROL OF HEALTH AND HYGIENE
- : QUANTITY AND QUALITY CONTROL
- : LABELLING AND MARKING REGULATION

- LABELLING : INFORMATION
- : INSTRUCTION
- : IDENTIFICATION

- MARKETING PRACTICES : TYPE OF MARKETING ORGANISATIONAL SET-UP
- : MARKETING - ADVERTISING POLICIES
- : COMPETITIONS
- : RETAIL, CHAINSTORE, SUPER MARKET,
OR SELF SERVICE STORE - SALES OUTLET

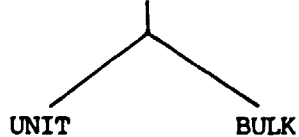
- MARKING : AS A MEANS OF COMMUNICATION THROUGH
PICTORIAL REPRESENTATION
- : FOR HANDLING AND STORAGE
- : FOR PRODUCT IDENTIFICATION AND
SAFETY

THE PACKAGE

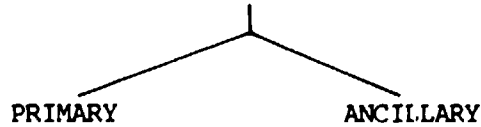
- PRIMARY PACKAGE : METAL CONTAINER
- : GLASS CONTAINER
- : COLLAPSIBLE TUBE (METAL OR PLASTICS)
- : PLASTICS CONTAINER (BLOWN, INJECTION OR THERMO-FORM)
- : MOULDED PULP CONTAINER
- : FLEXIBLES, ETC.

- TRANSPORT PACKAGE : WOODEN CASE OR CRATE
- : FIBRE BOARD CASE OR DRUM
- : SACK (PAPER, TEXTILE, PLASTIC)
- : METAL DRUM
- : GLASS CARBOY
- : PLASTICS DRUM, BOX OR CRATE
- : BALE
- : UNIT LOAD (PALLET)

CLASSIFICATION OF PACKAGE



CLASSIFICATION OF PACKAGING MATERIALS

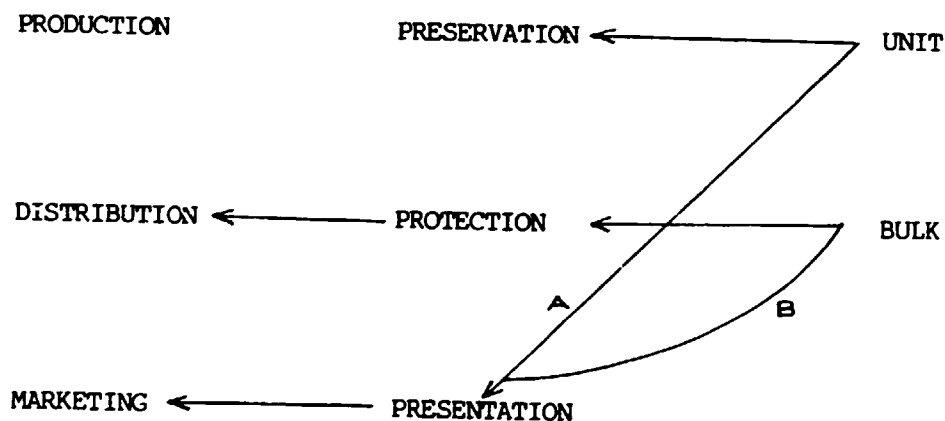
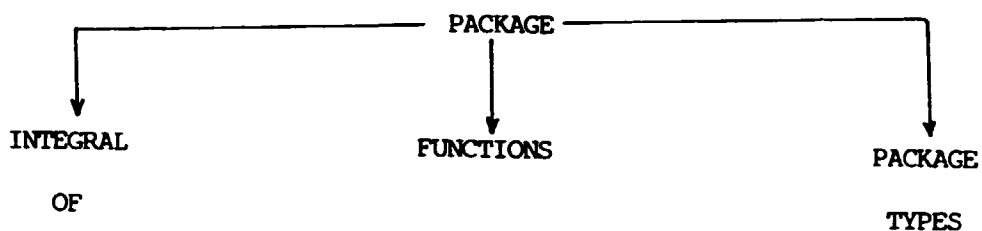


DEFINITION OF A PACKAGE IS AN INTEGRAL PART OF:

PRODUCTION

DISTRIBUTION

MARKETING



A. ASTHETICS

B. MARKING

STORAGE, HANDLING AND DISTRIBUTION

- . NEED FOR APPROPRIATE STORAGE CONDITION
- . EFFECT OF CLIMATIC CONDITIONS ON PACKAGING MEDIA
- . DUNNAGE AND RACKS
- . PALLETS

- . MECHANICAL HANDLING DEVICES - CONVEYORS
 - FORK LIFTS
 - HAND TRUCKS

- . CONTAINERISATION

- . MARKING

- STORAGE AND HANDLING :
- : TYPE OF STORAGE
 - : ENVIRONMENT OF STORAGE
 - : MAINTENANCE OF STORAGE
 - : SURROUNDINGS OF STORAGE
 - : MANUAL HANDLING
 - : SEMI-AUTOMATIC HANDLING
 - : AUTOMATIC HANDLING - LOW SPEED
 - MEDIUM SPEED
 - HIGH SPEED
 - : RACKS
 - : PALLETS

REMEDIAL : APPROPRIATE STORAGE CONDITIONS:
MEASURES WELL VENTILATED, OPTIMUM TEMPERATURE AND
HUMIDITY AND MOISTURE LEVEL CONDITIONS

GASES → : OXYGEN (MAJOR SOURCE)

ACCELERATED DETERIORATION WITH OUTER SOURCES

EFFECTS : CRACKING EMBRITTLEMENT, BREAKDOWN
(PLASTICS/RUBBER)
SKINNING (PAINTS) (OXIDE LAYER FORMATION)
DISCOLOURATION AND (PAPER AND JUICE)
LOSS OF PROPERTY

REMEDIAL : COVERED STORAGE
MEASURES BARRIER MATERIALS
SURFACE TREATMENT

HEAT → HIGH AND LOW → MORE ACTIVE IN THE PRESENCE OF OTHER FACTORS

↓
EFFECTS : DIMENSIONAL CHANGES (WOOD, PAPER, PRINTING)
: BRITTLENESS (PLASTICS)
: LOSS OF RESILIENCY (FOAMED PLASTICS)
: LOSS OF ELASTICITY (RUBBER)
: STIFFENING AND (LEATHER)
CRACKING

. WET HEAT IS MORE DANGEROUS THAN DRY HEAT

MICRO-ORGANISMS → FUNGI, MOLD, BACTERIA AND INSECTS



EFFECTS : MILDEW (TEXTILE AND RUBBER)
 : DETERIORATION (WOOD, PAPER ...)



PREVENTION : ANTI-FUNGAL TREATMENT
 : PRESERVATIVES
 : USE OF SYNTHETICS
 : AVOID DIRECT STORAGE ON GROUND
 : REDUCE TEMPERATURE VARIATIONS IN STORAGE
 : BY STERILISATION (ASEPTIC CONDITIONS)

OTHERS

DUST AND DIRT, SALT SPRAY, LIQUID WATER,
PRESSURE ETC.

- : AFFECTS SURFACE FINISH, COATING AND TEXTURE
- : LEADS TO CORROSION
- : WETTING, DELAMINATION
- : BREAKING EMULSION, LEAKAGE

PRESERVATION

- METALS : CORROSION PREVENTIVES AND LACQUERS
- WOOD : SEASONING, PRESERVATIVE TREATMENT,
IN-HOUSE VENTILATED STORAGE:
MAINTAIN OPTIMUM MOISTURE LEVEL
- PAPER AND BOARDS : CLEAN VENTILATED STORAGE, USE
DUNNAGE ON GROUND, AVOID LOW AND
HIGH HEAT AND HUMIDITY, ANTI-FUNGAL
PRESERVATIVES
CELLULOSICS FILMS (20°C AND 45% R.H.)
- PLASTICS FILMS : AVOID HIGH HEAT, SUSPEND CORES,
AND LAMINATES AVOID DIRECT LOAD ON REELS
- LABEL STOCK : IF VARNISHED ENSURE LOW STACKING,
AND CARTONS KEEP ON SIDE EDGES
- CFBs : USE DUNNAGE AND RACKS
AVOID HIGH HUMIDITY AND HEAT AND HIGH STACK
- TEXTILES AND : DO NOT EXPOSE TO DIRECT SUNLIGHT
LEATHER AVOID HIGH HUMIDITY, WARM AND DAMP
ATMOSPHERE
AVOID GASEOUS ATMOSPHERE

PACKAGE - AS A : AESTHETIC, PRESENTATION AND IMPULSE
SALESMAN : BUYING CREATION FACTORS

: MORE EMPHASISED IN MODERN MARKETING
FOR CONSUMER AND CONSUMER DURABLES

FACTORS : COLOUR
: COPY
: TRADE AND BRAND NAME
: WEIGHT AND MEASUREMENTS
: LETTERING
: REPRESENTATION
: PRODUCT IDENTITY
: PACKAGE STABILITY AND PROPORTIONS

PACKAGING COST : VISIBLE AND INVISIBLE
: TANGIBLE AND INTANGIBLE

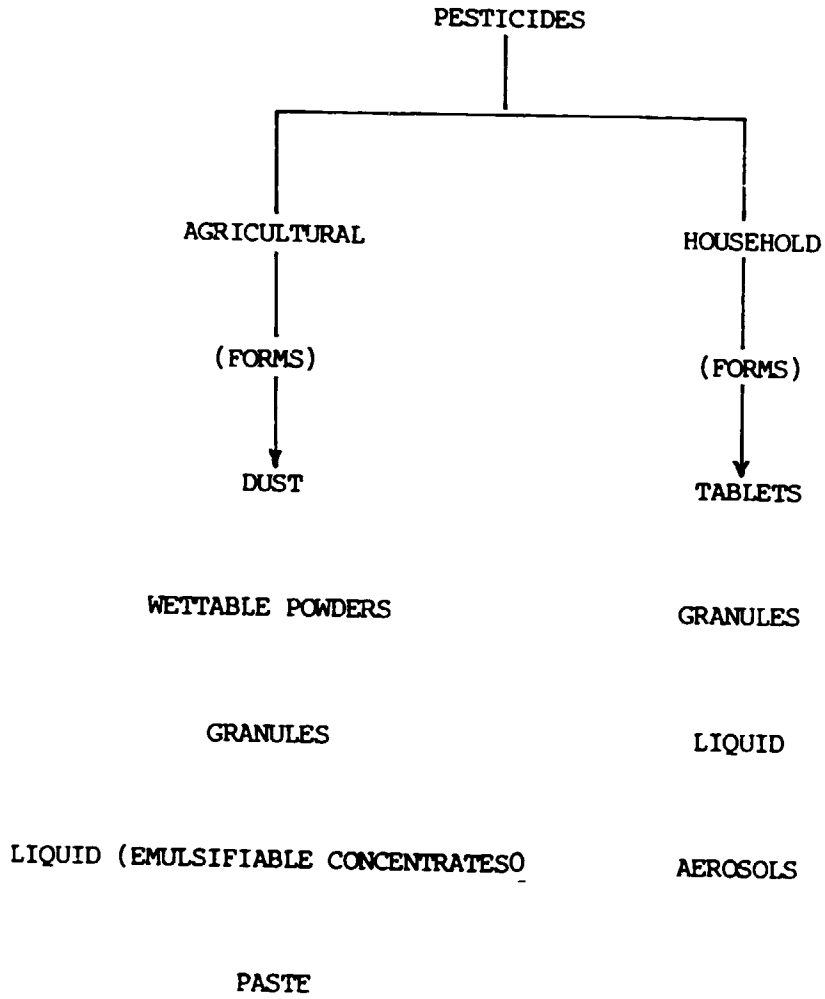
COST CONSTITUENTS : ORDER PROCESSING COST
: PACKAGING MATERIAL AND PACKAGE COST
: STORAGE AND HANDLING COST OF EMPTIES
: QUALITY CONTROL COST
: PACKAGING LINE OPERATION COST
: STORAGE AND WAREHOUSING COST OF FILLED PACKAGES
: FREIGHT COST
: INSURANCE COST
: COST DUE TOPACKAGE/PRODUCT - SPOILAGE AND LOSS
: REPLACEMENT COST

- : COST DUE TO LOSS OF GOODWILL AFFECTING
SALES AND MARKET SHARE
- : EFFECT OF PACKAGE ON SALES

PACKAGE - WHO IS HE : IS THE AMBASSADOR FOR THE PRODUCT
AND THE BUSINESS HOUSE

- : CARRIES THE MESSAGE OF GOODWILL OF
QUALITY AND ECONOMY TO
THE CONSUMER
THE COUNTRY
THE INTERNATIONAL MARKET
- : IDENTIFIES CONSUMER
- : IMPROVES SALES
- : INCREASES MARKET SHARE
- : INHERITS PROFITS

ANNEXURE - XVI



PESTICIDES

(TOXICITY LEVEL)

(COLOUR CODES)

HIGHLY TOXIC	-	RED
MEDIUM TOXIC	-	YELLOW
LESS TOXIC	-	BLUE
LEAST TOXIC	-	GREEN

PACKAGE SELECTION CRITERIA



FORM - PHYSICAL

TOXICITY LEVEL

ACTIVE INGREDIENT/DILUENT

PREVENTION OF ADULTERATION

DOSE LEVEL

STORAGE

TRANSPORTATION

DISPENSING

DISPOSAL

PRINTING/MARKING

SHELF-LIFE

LEGAL ASPECTS

PACKAGE TYPES CURRENTLY IN VOGUE (IN BANGLADESH)

UNIT PACK

GLASS BOTTLES : 50, 100, 200, 450, 500 ml

ALUMINIUM BOTTLES : 500, 1000 ml

HDPE BOTTLES : 125, 500 ml

HDPE BAGS : 50, 100, 500 gm, 1 kg, 2 kg

HDPE BAG IN HDPE BAG

PAPER BAG IN HDPE BAG

HDPE BAG IN PAPER BAG

HDPE BAG IN TINPLATE CONTAINER

LAMINATED BAG : PA/PA/PE

CO-EXTRUDED BAG : PP/PE

BULK PACK

CORRUGATED FIBRE BOARD BOXES (CFBs)

SOLID FIBRE BOARD BOXES (SFBs)

METAL DRUMS

PLASTIC JERRY CANS

CURRENT PACKAGE SYSTEMS

(OTHER COUNTRIES)

A. DUST-WETTABLE POWDERS

A.1 UNIT PACK	:	500 gms/1000 gm
		PE BAG + PAPER BOARD CARTON
		PE BAG + 'E' FLUTE CFB BOX
BULK PACK	:	WOODEN CONTAINERS
		CORRUGATED BOARD BOXES
A.2 DIRECT BULK	:	25 KG AND 50 KG
PACK		JUTE BAG + PE LINER
		LAMINATED JUTE BAG

B. CRANULES

- QUANTITY PER PACK : 500 gm, 1000 gm, 5000 gm
- B.1 PACK FORMS : LDPE BAG + PAPER BOARD CARTON
'E' FLUTED CFB BOX
TINPLATE CONTAINER
HDPE CONTAINER
WITH BULK CFB OR WOODEN CONTAINER
- B.2 DIRECT BULK : LDPE BAG + TINPLATE CONTAINER
PACK + PLASTIC CONTAINER

C. LIQUIDS

- CONVENTIONAL PACK : GLASS (GENERALLY DISCONTINUED)
- OTHERS : TINPLATE CONTAINER
ALUMINIUM CONTAINER
PLASTICS BOTTLES
WITH CFB BOX/WOODEN CONTAINER
AS BULK PACK

ANALYSIS OF ALTERNATES

NEW TRENDS

NEW MATERIALS AND SYSTEMS

PLASTICS FILMS

LOW DENSITY POLYETHYLENE (LDPE)

HIGH DENSITY POLYETHYLENE (HDPE)

POLYVINYL CHLORIDE (PVC)

POLYPROPYLENE (PP)

HIGH MOLECULAR WEIGHT HIGH DENSITY POLYETHYLENE (HM-HDPE)

LINEAR LOW DENSITY POLYETHYLENE (LLDPE)

POLYESTERS (PET)

BIAXIALLY ORIENTED POLYPROPYLENE (BOPP)

NYLON (PA)

METALLISED FILMS

ULTRA HIGH MOLECULAR HDPE

ETHYLENE VINYL ACETATE (EVA)

LAMINATES, PRIMERS AND COATING

FLEXIBLE LAMINATES	:	PAPER
	:	FILMS
	:	FOILS
	:	CELLULOSIC FILMS
MULTILAYERS CO-EXTRUDED FILMS	:	LD/LD
	:	LD/HD
	:	HD/LD/HD
	:	NYLON/SURLYN ETC.
	:	LD/TIE/NYLON/TIE/EAA

COATINGS : PVDC
: SURLYN
: EVOH
: EVAL

METALLISED FILM : PVC
: PS
: BOPP
: POLYESTER
: CELLOPHANE

UNIT CONTAINERS

. GLASS CONTAINERS

LIGHT WEIGHT GLASS

SHOCK/IMPACT RESISTANCE GLASS

COATED GLASS

. BLACK PLATE

. TINPLATE (PLAIN AND BEADED)

. TFS

. SHALLOW ALUMINIUM CONTAINERS

. HDPE

. PP

. PVC

- . PET (STRETCH BLOW MOULDED)(WITH AND WITHOUT BASE CUPS)
- . PVC (STRETCH BLOW MOULDED)(WITH AND WITHOUT BASE CUPS)
- . MULTILAYER BOTTLES

- . COMPOSITE CONTAINERS
- . LEAKPROOF COMPOSITES

- . TETRAPACK/BRICKS
- . STAND-UP POUCHES
- . PILLOW POUCHES
- . BAG-IN-BOX

- . LAMINATED TUBES
- . POUCH WITH SPOUTS

THERMOFORMED/VACUUM FORMED CONTAINERS

- | | | |
|------|---|--------------------|
| FROM | - | PVC |
| | | HIPS |
| | | PP |
| | | EXPANDED PS |
| | | EXPANDED PVC |
| | | ALUMINIUM |
| | | CO-EXTRUDED SHEETS |
| WITH | - | FOIL/POLY |
| | | PAPER/POLY |
| | | INJECTION MOULDED |
| | | THERMOFORMED LIDS |

BULK PACKS

A. WOODEN CONTAINERS

WOODEN CRATES

WOOD + CFB COMPOSITE PACKS

CFB - PACKS

PLASTIC CORRUGATED BOXES

B. M. S. DRUMS

G. I. DRUMS

ALUMINIUM CASKETS

PLASTIC CARBOYS AND DRUMS

PLASTIC CO-EXTRUDED DRUMS

LINED DRUMS

FIBRE DRUMS

TANKERS

FLEXIBLE BULKS

FLEXIBLE BULKS

JUTE BAGS

MULTIWALL PAPER SACKS

HDPE WOVEN SACKS (FLAT WOVEN)

HDPE WOVEN SACKS (CIRCULAR)

HIGH GAUGE LDPE BAGS

CROSS LAMINATED BAGS (PLASTICS)

JUTE/HDPE OR PP WOVEN BAGS

HDPE OR PP WOVEN/KRAFT BAGS

UNION BAGS (JUTE WITH SYNTHETICS)

I. B. CS.

1. TAPES

GUMMED PAPER TAPES

REINFORCED TAPES

WATERPROOF TAPES

PRESSURE SENSITIVE TAPES - PAPER

PVC

BOPP

HM-HDPE

CELLULOSIC FILM

CLOTH

2. CUSHIONING MATERIALS

WOOD WOOL

PAPER SHAVINGS

PADDY STRAW

CELLOPHANE WADDINGS

EXPANDED EPS BEADS

EXPANDED RUBBER CUTTINGS

EXPANDED POLYURETHANE (FOAM) CUTTINGS

EXPANDED POLYETHYLENE (FOAM) CUTTINGS

EXPANDED POLYSTYRENE CROSS LINKED

NON-CROSS LINKED

EXPANDED POLYETHYLENE CROSS LINKED

NON-CROSS LINKED

EXPANDED PVC

EXPANDED POLYURETHANE - FOAM MOULDED

- ONE COMPONENT SYSTEM

- TWO COMPONENT SYSTEM

EXPANDED RUBBER

CORRUGATED BOARDS

MOULDED PULP TRAYS

AIR BUBBLE FILMS

1. INK JET PRINTING

BAR CODING

2. VACUUM AND GAS FLUSH SYSTEMS

3. READY TO COOK BAGS

BOIL-IN-BAGS

SOLUBLE BAGS

REUSABLE/RECLOSABLE BAGS

IN-BUILT COMPONENTS' MIX CONTAINERS

STERILISABLE BAGS/CONTAINERS

OVENABLE TRAYS

GREASE AND OIL RESISTANCE COATINGS

CHILD RESISTANCE CLOSURES

RETORTABLE POUCHES

LAMINATE TUBES

TWIST-ON TWIST-OFF CAPS

SHRINK, STRETCH, SKIN AND BLISTER SYSTEMS

FIX-O-FORM LABELS

4. DEVELOPMENTS IN PACKAGING MACHINE

5. ULD SYSTEMS

6. CONTAINERISATION

CONCEPT(S)

POWDER

TABLET FORM ----- STRIP PACK

BLISTER PACK

AUTOMATION

INCREASED PRODUCTIVITY

REDUCED POLLUTION

BETTER HYGIENE

BUT - ASSOCIATION TO
PHARMA PRODUCTS

MECHANISATION AND AUTOMATION

CONVENTIONAL SYSTEM - LABOUR ORIENTED

HIGH POLLUTION

SAFETY FACTOR

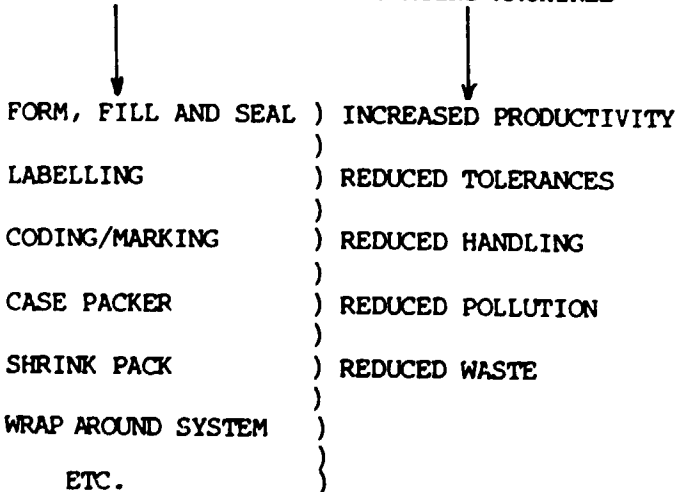
TIME FACTOR

LOSSES

TOLERANCES

MECHANISATION

- PACKAGING MACHINES



STORAGE, HANDLING AND DISTRIBUTION

. NEED FOR APPROPRIATE STORAGE CONDITION

EFFECT OF CLIMATIC CONDITIONS ON PACKAGING MEDIA

DUNNAGE AND RACKS

PALLETS

. MECHANICAL HANDLING DEVICES - CONVEYORS

- FORK LIFTS

- HAND TRUCKS

. CONTAINERISATION

. MARKING

OPTIMISATION OF FABRICS AND SIZE AND SHAPE

. PILLOW VS GUSSETED BAGS

. VOLUME VS FABRIC MATERIAL AREA

PACKAGE QUALITY ASSURANCE

(TYPICAL EXAMPLES)

A. PACKAGE : PRODUCT COMPATIBILITY

B. PAPERBOARD CARTONS: MOISTURE

GRAMMAGE

THICKNESS

STIFFNESS

- C. FLEXIBLE MEDIA : SUBSTANCES
THICKNESS
PERMEABILITY
TENSILE/ELONGATION
SLIP/FRICTION

- D. SACKS AND BAGS : BREAKING LOAD/ELONGATION
TEA
SEAM STRENGTH

- E. CFB BOXES : GRAMMAGE OF PLIES
BURSTING STRENGTH OF BOARD
COBB VALUE
COMPRESSION AND DEFLECTION

ANNEXURE - XVII

TESTS - FACTORS

OBJECTIVE

TEST METHOD AND TYPE OF TESTS

EQUIPMENT

CONDITIONING

SAMPLING

SPECIMEN PREPARATION

SIZE AND SHAPE OF SPECIMEN

THICKNESS MEASUREMENT

UNITS

CONCEPTS OF STATISTICS

PRESENTATION OF DATA

SIGNIFICANCE OF TESTS

- (i) TO MEET A SPECIFIC REQUIREMENT
- (ii) TO CONFORM TO A LAID DOWN SPECIFICATION
- (iii) FOR QUALITY CONTROL OF INCOMING/OUTGOING/
FINISHED MATERIALS
- (iv) FOR EFFECTIVE ORDER PROCESSING
- (v) TO HELP SUPPLIER TO EFFECT ORDER
- (vi) TO HELP THE MANUFACTURER TO MEET THE DEMAND AND PROCESS CONTROL
- (vii) TO MEET LEGAL REQUIREMENTS AND
- (viii) TO ACHIEVE CONSUMER SATISFACTION

PROPERTIES

- A. PHYSICAL AND MECHANICAL
- B. BARRIER
- C. THERMAL
- D. OPTICAL
- E. CHEMICAL
- F. ELECTRICAL

A. PHYSICAL/MECHANICAL PROPERTIES

THICKNESS

DENSITY

YIELD

TENSILE STRENGTH

ELONGATION

TEAR STRENGTH

SURFACE ENERGY

CO-EFFICIENT OF FRICTION

BURST STRENGTH

FLEX DURABILITY

STIFFNESS

IMPACT STRENGTH

B. BARRIER

MOISTURE VAPOUR

GASES (OXYGEN/NITROGEN/CARBON DIOXIDE)

C. THERMAL

HEAT SHRINKAGE

USAGE TEMPERATURE RANGE

D. OPTICAL

TRANSPARENCY

GLASS

HAZE

E. CHEMICAL

WATER ABSORPTION RESISTANCE TO OIL/GREASE

F. ELECTRICAL

DECAY OF STATIC CHARGE

THICKNESS

THICKNESS OF BOPP FILM CAN BE TESTED BY:

MICROMETER METHOD

ROLL WEIGHING METHOD

GRAMMAGE METHOD

MICROMETER METHOD

AS PER TEST METHOD ASTM D-374

USING DIAL DEAD WEIGHT MICROMETER

ROLL WEIGHING METHOD

$$\text{THICKNESS (MICRONS)} = \frac{\text{NETT WEIGHT OF FILM (IN ROLL) KG}^3 \times 10}{L \times W \times D}$$

L - LENGTH IN METRES

W - WIDTH IN METRES

D - DENSITY

GRAMMAGE METHOD

$$\text{THICKNESS (MICRONS)} = \frac{\text{GRAMMAGE}}{\text{DENSITY}}$$

GRAMMAGE - WEIGHT OF FILM IN GM/SQM

D - DENSITY OF FILM

THICKNESS AFFECTS PROPERTIES OF BOPP FILM LIKE:

1. MOISTURE AND GAS BARRIER
2. HEAT SEAL STRENGTH
3. TENSILE STRENGTH

DENSITY

REFERENCE: ASTM D 1505 - 60 T

- METHOD
- DENSITY GRADIENT COLUMN METHOD
 - COLUMN CONSISTS OF A MIXTURE OF TWO LIQUIDS OF TWO DENSITIES
 - PROPORTION CHANGE UNIFORMITY FROM TOP TO BOTTOM
 - DENSITY GRADIENT INDICATED BY FLOATING CALIBRATED GLASS MARKERS
 - CLEAN BUBBLE FREE FILM WET WITH DENSER FLUID AND INTRODUCED IN THE COLUMN
 - FILM ATTAINS STABLE POSITION IN 2 HOURS
 - DENSITY MEASURED BY LINEAR INTERPOLATION BETWEEN THE TWO NEAREST MARKERS
- SIGNIFICANCE
- LINKED TO RESIN AND FILM MAKING PROCESS
 - LINKED TO YIELD AND RELATED PROPERTIES

YIELD

REFERENCE: ASTM D 4321-83

- . COMMERCIALLY IMPORTANT INDICATOR
- . IDENTIFIES NUMBER OF PACKS PER KG

$$\text{YIELD (SQ.M./KG)} = \frac{1000}{\text{DENSITY X THICKNESS}}$$

TENSILE STRENGTH

REFERENCE: ASTM D - 882 - 67

$$\text{TENSILE STRENGTH} = \frac{P}{t \times W}$$

(kg/mm²)

[P : BREAKING LOAD KGF(N)]

(t : SPECIMEN THICKNESS - MM)

(W : WIDTH OF TEST PIECE - MM)

TENSILE STRENGTH : MEASURED ALONG MD AND CD
AND EXPRESSED SEPARATELY

: HIGHER ALONG DIRECTION OF STRETCH

STRESS-STRAIN CURVE: HELP TO MEASURE

YIELD STRENGTH : INDICATES TOUGHNESS OF FILM

MODULE OF ELASTICITY : INDEX OF STIFFNESS OF FILM

HIGH TENSILE VALUE : FACILITATES EASE IN HIGH SPEED
WRAPPING/PACKAGING MACHINERY

ELONGATION

REFERENCE: ASTM D - 882 - 67

MEASURED ALONG WITH TENSILE PROPERTY

PERCENTAGE ELONGATION : $\frac{\text{ELONGATION AT RUPTURE}}{\text{ORIGINAL SPECIMEN LENGTH}} \times 100$

. INDICATES ABSORPTION AND DISSIPATION OF SHOCK/ENERGY

. RELATED TO TEA FACTOR

TEAR STRENGTH

REFERENCE: ASTM D - 1922 61 - T

TEST MEASURES THE ENERGY

ABSORBED BY THE SAMPLE IN

PROPAGATING A TEAR FROM THE INITIAL CUT

HIGH TEAR USEFUL FOR HEAVY PACKAGES AND

INDUSTRIAL APPLICATIONS

LOW TEAR DESIRABLE FOR EASY OPENING PACKAGES

CO-EFFICIENT OF FRICTION (SLIP)

REFERENCE: ASTM 1894 61 - T

FILM TO FILM

FILM TO METAL

- . DETERMINED BY THE MOVEMENT OF A PREMADE SLID
OVER A FILM OR METAL SURFACE
- . CAN BE MODIFIED TO MEASURE AT ELEVATED TEMPERA-
TURE TO ASSESS TEMPERATURE DEPENDENCE OF FRIC-
TION. THE RESULTANT HIGH FRICTION VS ADHERANCE
TO MACHINE SURFACE CAN BE IDENTIFIED
- . LOADS AND SPEED CAN BE VARIED TO DUPLICATE
ACTUAL PRODUCTION RUN CONDITIONS
- . PLAYS A MAJOR ROLE IN FILM BEHAVIOUR IN PACKAGING
MACHINERY
- . RELATED TO STACK PERFORMANCE OF POUCHES AT
RETAIL ENDS

BLOCKING

REFERENCE : ASTM D 1893 - 61 - T

- . IS CLOSELY LINKED TO FRICTION

- . SIGNIFICANT DURING
SHEET FED MACHINE OPERATION
STORAGE OF EMPTY POUCHES
SEVERE WHEN IN CONTACT WITH SMOOTH SURFACES

BURST STRENGTH

REFERENCE : D - 2738

- . IS THE RESISTANCE OFFERED TO
A STEADILY INCREASING PRESSURE
APPLIED AT RIGHT ANGLES

- . MEASURES THE CAPACITY TO
ABSORB ENERGY

- . INDICATES AS A BASIC PROPERTY
MATERIAL STRENGTH AND LOAD
BEARING CAPACITY

FLEX

REFERENCE : ASTM D - 643 - 69

MEASURED BY REPEATED FOLDING THE FILM FORWARD
AND BACKWARD AND NUMBER OF DOUBLE FOLDS AT
FAILURE IS MEASURED

- . INDICATES FILM CONSISTANCY AND UNIFORMITY
- . PINHOLES AND FRACTURES AFFECT PERFORMANCE

STIFFNESS

REFERENCE : ASTM D - 747

THE RESISTANCE OFFERED BY THE FILM SPECIMEN
TO BENDING IS MEASURED AND EXPRESSED AS STIFF-
NESS VALUE

- . IS THE PROPERTY/RESISTANCE OF THE FILM TO DISTORTION
- . INFLUENCED BY FILM THICKNESS AND INHERENT STIFF-
NESS OF THE MATERIAL
- . HAS A DIRECT BEARING ON ITS MACHINE PERFORMANCE
PARTICULARLY AT FEED SECTION WHEN A CUT LENGTH
IS PUSHED FORWARD

IMPACT STRENGTH

REFERENCE : ASTM D 1709

- . MEASURED BY FALLING DART METHOD TO ARRIVE
AT A RUPTURE VALUE
- . REPRESENTS THE ABILITY OF THE FILM TO WITH-
STAND SHOCK PERFORMANCE
- . RESULTS CORRELATED TO DROP PERFORMANCE OF
FILLED BAGS AND POUCHES

HEAT SHRINKAGE (EFFECT OF TEMPERATURE)

REFERENCE : ASTM D 2732

LINEAR THERMAL SHRINKAGE AT HIGH TEMPERATURE
EXPRESSED AS PERCENTAGE OF ORIGINAL DIMENSION

$$\text{HEAT SHRINKAGE} = \frac{\text{LENGTH (OR.)} - \text{LENGTH (CAL)}}{\text{LENGTH (ORI.)}} \times 100$$

- . RELATED TO PROCESSING TECHNIQUE
- . RELATED TO LEVEL OF ORIENTATION
- . RELEVANCE TO END-USE APPLICATION
- . LOSS OF STRENGTH AT LOW TEMPERATURE
- . DEVELOPMENT OF BRITTLENESS

HEAT SEALABILITY

REFERENCE : ASTM F - 88 - 85

- INFLUENCING PARAMETERS - TEMPERATURE, TIME AND PRESSURE
- THESE VARY FROM PROCESS TO PROCESS AND MACHINE TO MACHINE
- EFFECTIVE SEAL IS A MUST TO ENSURE COMPLETENESS OF THE PACKAGE
- TEST CONDITIONS SHOULD SIMULATE ACTUAL OPERATION CONDITION
- TESTED BY MEANS OF TENSILE MACHINE
- IS THE FORCE REQUIRED TO PEEL APART THE SEALED SUBSTRATES
- COULD BE A DYNAMIC OR A STATIS TEST SCHEDULE

GLOSS

REFERENCE : ASTM D 2457

- . MEASURE OF THE ABILITY OF THE FILM TO REFLECT INCIDENT LIGHT
- . HIGH GLOSS GIVES PLEASING SPARKLE FILM AND SHARP IMAGE OF ANY LIGHT SOURCE

- . IT VARIES WITH SURFACE SMOOTHNESS AND FLATNESS
- . CHIEFLY DUE TO REFLECTION AT THE SURFACE
AND THEREFORE PHYSICAL/CHEMICAL SURFACE CHANGE
WILL AFFECT GLOSS

HAZE

REFERENCE : ASTM D - 1003

- . IS A MEASURE OF THE MILKYNESS
- . CAUSE OF 'HAZE' IS SURFACE IMPERFECTION OF
THE FILM
- . NOT NECESSARILY PROPORTIONAL TO THE FILM
THICKNESS
- . HAZE IS CAUSED BY LIGHT BEING SCATTERED BY
SURFACE IMPERFECTIONS, IN HOMOGENITIES IN
FILM DUE TO VOIDS, UNDISSOLVED ADDITIVES,
CROSS LINKED MATERIAL ETC.

STATIC CHARGE - DECAY

ANTISTATIC AGENTS ARE OFTEN ADDED FOR CERTAIN
APPLICATIONS. THE CHARGE DISSIPATES SLOWLY. THE METHOD
HELPS TO ASSESS DECAY RATE.

MOISTURE VAPOUR TRANSMISSION RATE

REFERENCE : ASTM E - 96 - 63 - T

- . REPRESENTS WATER VAPOUR FLOWS IN
UNIT TIME THROUGH UNIT AREA UNDER
SPECIFIC TEMPERATURE AND HUMIDITY
CONDITIONS

- . DISH METHOD/INSTRUMENTATION
METHODS ARE BOTH ADOPTED

- . HIGHLY SIGNIFICANT AS END-USE
PERFORMANCE AS POUCH AND BAG
PARTICULARLY FOR HYGROSCOPIC
PRODUCTS

- . DIRECTLY RELEVANT TO SHELF-LIFE
EVALUATION/OFFERED

GAS TRANSMISSION RATE

REFERENCE : ASTM D - 1434

- . REPRESENTS QUANTUM OF FLOW OF GASES
(AIR, OXYGEN, NITROGEN, CARBON DIOXIDE)

- . FLOW IS PROPORTIONAL TO:
 - SURFACE AREA

 - TIME

 - PARTIAL PRESSURE DIFFERENTIATED AND
INVERSELY TO THE THICKNESS

- . SIGNIFIES THE EXTEND OF BARRIER TO GASES

- . SIGNIFICANT FOR PRODUCE TO LOSE CO₂ AND
PICK-UP O₂

- . SIGNIFICANT FOR OILY AND FATTY FOODS TO BE
FREE FROM OXYGEN

- . SIGNIFICANT FOR CAP/MAP PACKAGING SYSTEMS

- . SIGNIFICANT FOR MAINTENANCE OF VACUUM AND
GAS FLUSH PACKAGING SYSTEM

LAMINATES/POUCHES

- (i) BOND/PEEL STRENGTH
- (ii) HEAT SEAL STRENGTH
- (iii) LEAK TEST
- (iv) COMPRESSION STRENGTH

SHELF-LIFE EVALUATION

- (i) BASIC DATA
- (ii) METHODS : MOISTURE GAIN OR LOSS

SUBSTITUTION METHOD

RATIO METHOD

RATIO OF PERMEABILITY

LINEAR ABSORPTION ISOTHERM METHOD

PRODUCT SPOILAGE BY MOISTURE

PRODUCT SPOILAGE BY OXYGEN

EFFECT OF COMBINED SITUATION

ANNEXURE - XVIII

VISIT TO DEALERS AND RETAILERS

As many as seven dealers/retailers are visited in the Narsingdi and Gazipur areas. The information gathered and specific observations made are listed below:

1. The consignments are either door delivered at the dealers' shops or the dealers collect from the manufacturers/repackers' godowns/warehouses.
2. The consignments are taken in small quantities depending on the season and demand. The inventory could be anywhere between 2-3 days to 3 months.
3. The retailers collect in person their requirements from the nearest dealers as per market requirements.
4. Some of the shops possess license both as dealers and retailers.
5. The dealership is normally granted against a deposit and on commission basis.
6. The S.M.S. of the Plant Protection Wing working under the Deputy Director of Department of Agricultural Extension is the authority to grant license for dealership/retailership.

OBSERVATIONS

1. The dealers and retailers by far are not qualified and quite often deal with other products like fertilizers.
2. The storage conditions of the pesticide products leave much to be desired. There is tremendous scope for improvement.
3. Examination of some of the products (packs) displayed indicate batch No. and Expiry date but no manufacturing date is shown. In as much as normally a two year shelf-life is expected, there is a need to put manufacturing date as well.
4. The above details should be both on the individual packs as well as on the outer bulk pack.
5. In quite a few cases the packs displayed have become very dirty and need to be cleaned to read the matter. Often the cleaning also does not help. The storage conditions should therefore be improved and it should be made mandatory to store in closed glass panelled cupboards.
6. The CFB boxes are to a large extent found damaged or spoiled. These include delamination of plies, split open at manufacturer's joint, compression of boxes and tearing etc. The retailers/dealers inform that they receive the boxes in such manner. This clearly indicate that the boxes suffer from transit and handling damages and hence need to be strengthened.

7. In most of the bottles, the quantity of fill and brimful capacity leave a very high ullage (head space). This only further emphasises the point for working out the exact specifications for glass bottles.

In some cases the ROPP cap was found damaged, and in some cases leakage and in some other cases the labels smudged and torn.

8. The shelf-life in all cases is expected to be 2 years. Two peculiar situations are observed. In one instance the date of packing/manufacture on the label pasted on the CFB box is 30th July, 1990 and the labels on the bottles inside indicate expiry date December 1992. In the other instance, date on the outside label is June 1990 and inside marking is December, 1991.

The above aspect need to be immediately looked into and rectified.

Possibly through a circular to all packers they should be instructed to take back the product, if not sold within a prescribed period say 6 months.

9. Quite often the CFB boxes are stored direct on gunny or ground. The storage should be on treated/painted wooden/metal racks and maximum 4-5 high CFB boxes. Presently stack height is even upto 12-14 boxes.

10. In most of the places, the shops do not carry a sign board indicating "name of shop, shop No., street No. place/address" etc. This should be made compulsory. Besides they should also clearly display "approved pesticide sale dealer/retailer and approval code or No.".
11. While granting licence for shops for sale of pesticides, it should also be ensured that the adjacent ones are not dealing with food or pharma products. It would be desirable to prepare a check-list and suggest the S.M.S. and extension staff to follow these while processing for licensing or renewal.
12. In respect of some of the labels pasted on the CFB boxes, it is found the bottom portion of the diamond does not carry the requisite colour. Such cases should be notified to the concerned firms for immediate correction and future follow-ups.

ANNEXURE - XIX

SPECIFICATION PARAMETERS FOR MATERIALS AND PACKAGES

1. CORRUGATED FIBRE BOARD BOXES

Example

Material of construction	:	3-ply Corrugated Fibre Board
Grammage of paper (liner and corrugating medium) (Min.)	:	*150 gsm/150 gsm/150 gsm
Quality of paper	:	Virgin Kraft
Type of flute	:	'B' (Narrow)
Direction of flute	:	Vertical
Type of adhesive	:	Starch based
Bursting Strength of board (kg/cm ²) (min.)	:	7.00
Cobb Value (30 mts. cob) (Max.)	:	120 g/m ²
Stype of box	:	R.S.C. (Regular Slotted Container)
No. of pieces/box	:	Not more than two
Manufacturer's joint	:	By staple pins
Internal dimensions (±3mm)	:	X cm x Y cm x Z cm
Crease quality	:	Should not show any visible cracks/damaged when folded 90° forward or backward
Compression Strength of box (kg.) (Min.)	:	150
Print details	:	As provided/Artwork
Packaging and Forwarding	:	In bundles of 'X' Nos.

* For waterproofing, the outer ply shall be coated or shall be 100 gsm kraft/80 gauge LDPE/100 gsm kraft or 80 gsm kraft/60 gsm bitumen/80 gsm kraft.

Other details as per B D S 1102 (Part I) 1984.

2. PLATES AND HONEY COMB PARTITIONS

Similar details on materials.

3. LABEL

BASIC MATERIAL

TYPE AND QUALITY OF MATERIAL

DIMENSIONS

GRAMMAGE (GSM, MIN.)

BURSTING STRENGTH

TYPE OF ADHESIVE

PRINT DETAILS

4. GLASS BOTTLES

CLARITY

COLOUR

AIR BUBBLES

ALKALINITY/TYPE OF GLASS

WEIGHT

DIMENSIONS

BRIMFUL CAPACITY

NOMINAL CAPACITY

NECK FINISH

IMPACT RESISTANCE

HYDRAULIC PRESSURE

VERTICALITY

NOTE: Refer Drawing appended giving typical bottle 50 ml
- details for 25 mm ROPP cap with cap details. Other
specific details to be included for glass bottles
and ROPP cap are also attached.

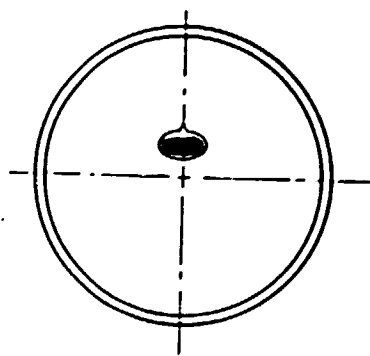
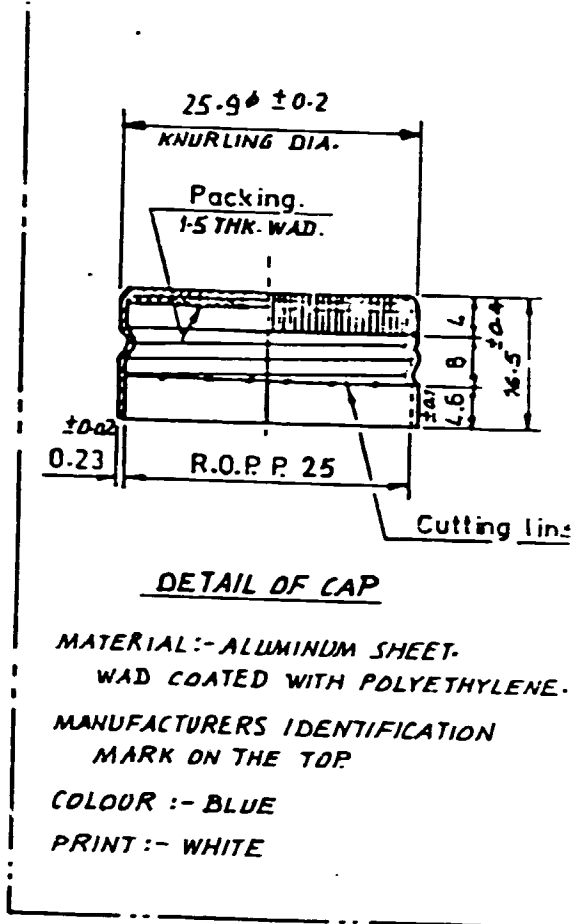
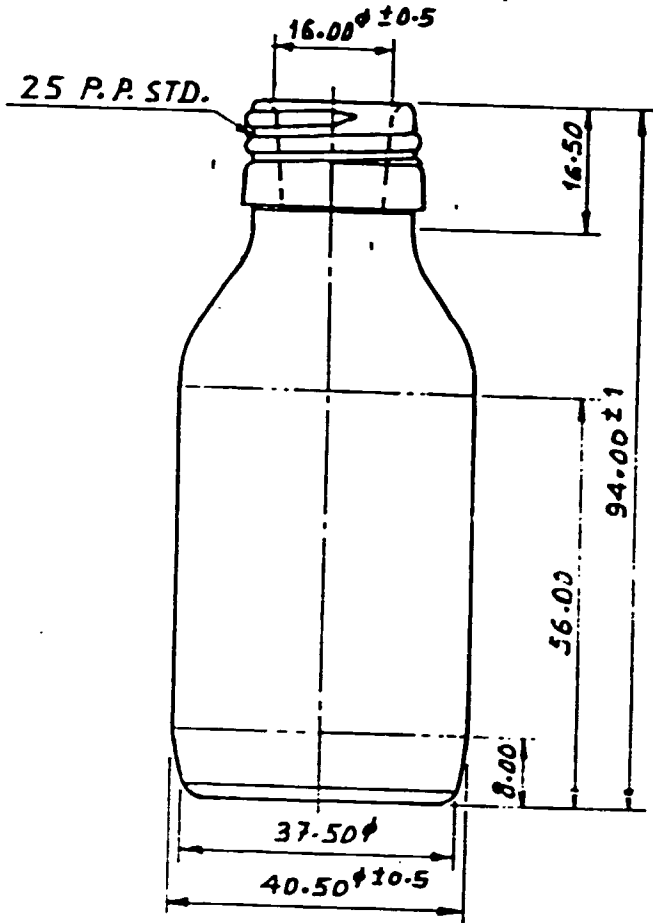
GLASS BOTTLE - 50 ML

Capacity : 50 ml
Material of construction : Glass
Colour : Amber

DIMENSIONS IN MM

Total Height H : 94 ± 1
Height upto Shoulder H₁ : 56
Neck Height H₂ : 16.5
Diameter D : 40.5 ± 0.5
Mouth Opening O : 16.0 ± 0.5
Average Weight in g : 65 ± 3
Overflow Capacity in ml : 65 ± 3
ROPP : To fit 25 mm blue coloured cap
Manufacturers identification mark : On the bottom

GLASS BOTTLE 50 ML.



NOTES:-

- MATERIAL :- GLASS
- COLOUR :- AMBER
- CAPACITY :- 50 ML.
- OVERFLOW :- 65 ± 3 ml.
- NECK :- 25 P.P. STD.
- WEIGHT :- 65 ± 3 GMS.
- ALL DIMENSIONS ARE IN MM.

5. ROPP CAP

A typical example for ROPP cap 25 mm given below:

DESCRIPTION

The shell shall be in new and clean condition and shall be reasonably free from all foreign matter. The skirt of the shell should be such that on opening the assembled closure, a ring of metal shall part from the main body of the shell. The wad should be retained by the bead.

Material of Construction : Aluminium sheet of thickness 0.23 ± 0.02 mm

DIMENSIONS IN MM

Diameter on Knurling	D :	25.9 ± 0.2
Total Height	H :	16.5 ± 0.4
Skirt Height	H_1 :	4.6 ± 0.1
Wad Thickness	:	1.5
Wads	:	Coated with polyethylene
Manufacturers Identification mark	:	On the cap
Colour	:	Blue
Print	:	White

Similar details to be worked out for other capacities.

6. HDPE CONTAINERS

Material Grade/MFI

Brimful capacity

Nominal capacity

Type of container

Type of closure

Type of plug

DIMENSIONS

Print/Label details

Weight

Container - Neck I. D.

Bung seat \emptyset)	
)	
Bung height)	
)	
Wall thickness)	Typical details
)	
Sealing ring)	are given in the
)	
Bung - inner cap (plug))	drawing attached
)	
Collar diameter)	for 5 L HDPE
)	
Collar thickness)	Jerry Can
)	
Neck dia.)	
)	
Cap)	
Dimensional details)	

7. TAPE:(GUMMED PAPER OR BOPP/PVC)

Example

Base material : Kraft paper
Base material grammage : 80 gsm
Base material thickness : -
Gum used : Animal glue
Gum coating quantity : 30 gm/m²
Adhesion performance : Should fibre tear
when applied and removed
Width of tape : 50 mm
Length per roll : 200 mtr.
Tensile strength : 2 kg/cm²
Print details : As per Artwork

8. PLASTIC BAG (POUCH)

(Example HMHDPE Pouch)

Material : HMHDPE
Grade : Virgin (.....)
MFI :
Thickness : 0.12 mm (500 gauge) ± 10%
WVTR (Max.) : 2 gms/m² at 38° ± 1°C, 90% ± 2% R.H.
Dimensions : L cm x h cm
Style : Tubular (bottom seal)/3 side seal

Treatment	:	40-42 dynes/cm ²
Print details	:	As per artwork/provided
Seal width	:	Min. 3 mm
Weight per 100 bags	:	'X' gms
Tensile strength	:kg/cm ²
Percentage elongation	:%
Dart Impact strength	:gms

INTERNAL SQ. THREADS TO
SUIT MOUTH OF CONTAINER
COLLAR

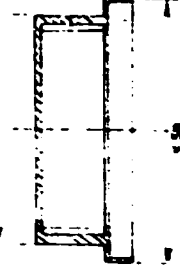
8 NOS. TEETH FOR SEALING

CONNECTORS TO COLLAR
TO BREAK WHILE OPENING

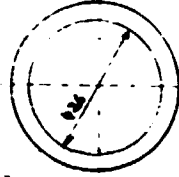
5 LITERS
H.D.P.E. CONTAINERS

4 SLOTS TO MATCH PROJECTION
ON MOUTH COLLAR

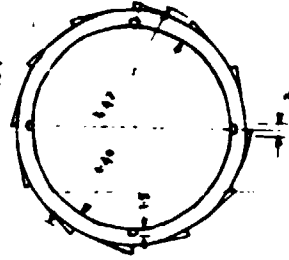
12 NOS. TEETH FOR SEALING



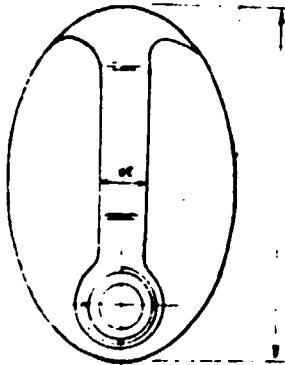
ITEM NO. 2
CAP WITH SEALING COLLAR



ITEM NO. 2
INNER CAP

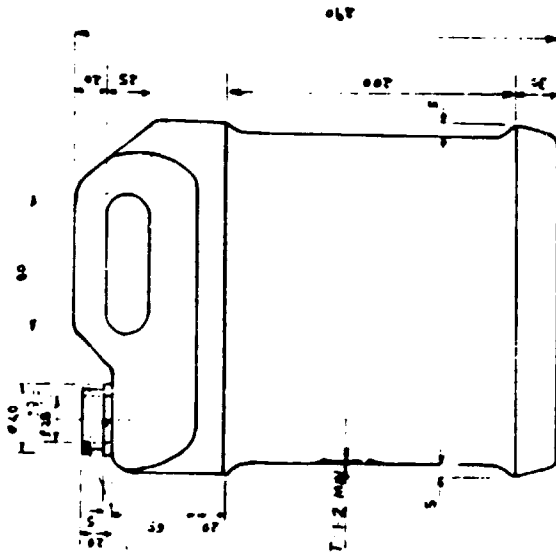


ITEM NO. 1
SEALING RING



4 NOS. PROJECTIONS
TO LOCATE ITEM 1

5 LT. THREADS
SQ. 4 mm PITCH



SCALE 1:3
CONTAINER

ANNEXURE - XX

PACKAGING MATERIALS AND PACKAGES

TESTING, QUALITY CONTROL AND INSPECTION EQUIPMENTS

- A. 1. Abrasion Tester
2. Balance
3. Bursting Strength Tester
4. Climatic Chamber
5. Cobb Tester
6. Compression Tester
7. Dart Impact Tester
8. Elkometer
9. G.T.R. Tester
10. Heat Sealer
11. Humidity Cabinets
12. Hydrostatic Pressure Tester
13. Hygrometer
14. Izod/Charpy Impact Tester
15. Melt Indexer
16. Micrometer/Thickness Gauge
17. Moisture Meter
18. Ovens
19. Pendulum Impact Tester
20. pH Meter

21. Pin Adhesion Tester
22. Polarimeter
23. Pouch Leak Tester
24. Puncture Tester
25. Quadrant Scale
26. Stiffness Tester
27. Tape Pressure (Adhesion) Tester
28. Tear Tester
29. Tensile Tester (Universal Testing Machine)
30. Thermohygrograph
31. Torque Tester (for caps)
32. Verticality Tester (for glass bottles)
33. Viscometer
34. Wax Pick (Danison Wax No.)
35. Weatherometer
36. Wet and Dry Thermometer
37. WVTR Tester
38. Templates/Calibration Units

B. 1. Glass Apparatuses

2. Soxhlet set-up
3. Desiccators
4. Lab. Chemicals etc.

C. 1. Drop Tester (Single Arm, Divided Table Top,
Sling and Quick release)

2. Inclined Impact Tester
3. Compression Tester
4. Vibration/Bump Tester
5. Shower Tester
6. Stack Load Testing set-up

ANNEXURE - XXI

SOURCES OF SUPPLY - PACKAGING MATERIALS

AND PACKAGE TESTING EQUIPMENTS

1. A. W. Lorentzen & Wettre
Alstromergatan - 23,
Post Box 49006,
Stockholm - 49,
Sweden
2. Testing Machine Inc. (TMI),
400, Bayview Ave.,
Amity Ville,
New York, 11701,
U. S. A.
3. D. R. Lenk GmbH,
C. H. - 8274,
Tagar Wilen,
Oberdorfstr, 15,
Switzerland
4. L. A. B. Corporation,
P. B. Box G,
Skaneateles,
New York, 13152
U. S. A.
5. Devenport (London) Limited,
Twein Road,
Walwyn Garden City,
Hertfordshire,
England
6. T. N. O.,
Shoemakerstrasse,
Delft,
Netherland
7. American Glass Research Institute, Inc.,
P. O. Box 149,
Butler,
Pennsylvania,
U. S. A.
8. Sanso Company Limited,
No. 31-6, 1-chome,
Hamamatsu-cho,
Minato-ku 105,
Tokyo, Japan

9. H. E. Messmer Limited,
144-C, Offord Road,
Islington,
London N-1, U. K.
10. Customs Scientific Instruments Inc.,
New Jersey, 07981,
U. S. A.
11. Tokyo Seiki Seisakusho Limited,
15, 5-chome,
Takinogawa, Kita ku,
Tokyo, Japan
12. Sargent-Welch Scientific Company,
7300, N. Linden Avenue,
Skokie, Illinois - 60076,
U. S. A.
13. Nagrett & Zambra Limited,
15, New Bond Street,
London WIY OLL,
U. K.
14. C. F. Casella & Company Limited,
Regent House,
Brittannia Walk,
London NI TND, U. K.
15. Oal Associates,
P. O. 788, Westbury,
New York, 11590,
U. S. A.
16. Ultrakust,
Ceraetabau GmbH,
Cokg 8-375, Ruhmannsfelden,
West Germany
17. Karl Frank GmbH,
694, Neikeum,
Bergester, P. O. Box 1320,
West Germany
18. Saurashtra Marketing Corporation,
Churchgate Chambers, 606,
5, New Marine Lines,
Bombay - 400 020, India

ANNEXURE - XXII

GUIDELINES FOR EVALUATION OF PACKAGING SYSTEM

FOR PESTICIDES AND/OR THEIR FORMULATIONS

- A. The pesticide/formulation manufacturer/packer should prepare the complete details of the product, the unit, intermediate and bulk pack as well as other packaging components and adjuncts and interact with the Bangladesh Standards and Testing Institution as well as the Plant Protection Wing with his proposal of formulating/packing/marketing of the product.
- B. The formulator/manufacturer/packer should carry out the necessary shelf-life study with the actual product/package (unit) for two years at cyclic conditions should be assessed from the meteorological department which could be on a season to season basis, in respect of temperature and relative humidity. The accelerated conditions refers to $55^{\circ}\text{C} \pm 1^{\circ}\text{C}$ and $90\% \pm 2\%$ Relative Humidity.

Both the product and packages should pass these exposure conditions/tests in terms of efficacy and performance.

The above compatibility studies also should be simultaneously carried out by Plant Protection Laboratory or at any other Laboratory recognised by the Plant Protection Wing.

C. Package performance - Laboratory simulated Transportworthiness tests:

The firm seeking registration should furnish complete details/specifications of primary (unit), intermediate, and transport (bulk) packaging as well as all components used, along with the transportworthiness test report.

The transportworthiness tests would include the following:

A minimum of 6-8 completely made-up filled packages are required for following sequential tests.

Pack - 1: Vibration test, Rolling test, Inclined Impact tests

Pack - 2: Vibration test, Rolling test, Drop test

Pack - 3: Rolling test, Inclined Impact test, Drop test

Pack - 4: Shower test

Pack - 5: Stack (Static) Load test

The test - details are:

. VIBRATION TEST : Keep the pack on a Vibration table for 40 mts. - 60 mts. In the case of packs with glass bottles, the packs shall be kept upside down.

Frequency : 120 CPM, Amplitude : 2.54 cm

. ROLLING TEST : Roll the packs along either axis for 10 meters.

. INCLINED IMPACT TEST : Keep the pack on the trolley of the inclined impact tester and subject to four impacts
- one on each side and one on each end panel.
Impact Velocity : 8 km/hour

. DROP TEST : The packs (upto a gross weight of 20 kg) shall be subjected to a sequential drop test from a height of 42" (105 cm) as below, on a concrete ground.

First drop - on base

Second drop - on front side

Third drop - on rear side

Fourth drop - on one end

Fifth drop - on other end

Sixth drop - on top

. STACK LOAD TEST : Place the filled and closed box on a clean, plain ground and place a static load with a metal or wooden plate a weight equivalent of the number of boxes normally stacked multiplied by three times for a period of 48 hours.

. SHOWER TEST : A completely filled and closed box shall be subjected to a normal shower for a period of 20 minutes from a height of about 2 mtrs. should There/be facility for flow of water instead of collecting around the package or stagnation.

D. FIELD TRIALS : A minimum of 25 completely filled and closed packages each shall be transported in the usual manner to atleast two destinations representing different typical climatic conditions and distribution. The packages and products shall be assessed for their performance and quality at the destination points.

The details of all the above shall be submitted to the Plant Protection Wing. A Committee consisting of packaging material and package manufacturers, Bangladesh Standards and Testing Institution, Pesticide manufacturers/formulators and Plant Protection Wing shall review and accept or suggest modifications or additional trials as the case may be. Accepted ones shall be finalised as a National Standard (B D S).