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CONSOLIDATION OF CAPACITY OF INSTITUTE OF FOOD TECHNOLOGY THROUGH CREATION OF A NATIONAL FOOD PACKAGING CENTRE

DP|BRA|82|030

BRAZIL

Technical report: Institutional development - Food packaging and processing *

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

Based on the work of Mr. B.I. Turtle,
Expert in food packaging and processing - institutional development

United Nations Industrial Development Organization
Vienna

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ABSTRACT

As part of Project DP/BRA/82/030 the expert visited CETEA - ITAL from 16 November to 15 December,1985. During the visit a short course of eight colloquia was presented, dealing with important new developments in food packaging and processing. The current work on flexible and semi-rigid containers for thermal processing was reviewed and appraised. The methods used for aseptic packaging were explained, and laboratory procedures and equipment essential for the validation of steribility detailed. Assistance was also given with from other projects on food packaging, and a visit was made to Alcan São Paulo to discuss joint development work with CETEA. In all these areas specific recommendations were made, and the report concludes with general recommendations as to future activities.

CONTENTS

INTRODUCTION

CETEA, the National Food Packaging Center is part of the Instituto de Tecnologia de Alimentos, ITAL. It is situated in Campinas, in the State of São Paulo. The priority received by the Food Packaging Section in 1969 made ITAL the leading Institute in this area in Brasil, and in 1982 it was decided to put into operation an integrated program to expand the packaging activities and facilities. This was sponsored by the Government of the State of São Paulo, the Brasilian Federal Government, and the United Nations Development Program through the United Nations Industrial Development Organisation, UNIDO.

The UN - Brasil Project to create a National Food Packaging Center is identified as Project DP/BRA/82/030, and has a duration of five years, beginning in 1982. The aims of the Center will be, "to increase and ensure sufficient food supplies to the country's population and to increase the export of processed foods, given the vich endowment of agricultural land coupled with the need to alleviate balance of payments problems".

CETEA now has four experienced engineers with MSc degrees, ten graduates with BSc. degrees, eleven technicians, one secretary, and four support staff. It has seven well equipped laboratories occupying 1000m² of space, and an office building of 400m² area is under construction. The CETEA intend structure consists of four groups, Metal and Glass, Plastic and Paper Board, Food Packaging Systems, and Food Analysis, under the overall control of Project Coordinator Luis Fernando Ceribelli Madi. Quite soon after the commencement of the mission it was apparent to the expert that CETEA's facilities already compared favourably with groups of a similar size, and they are continually improving. Under the guidance of the more experienced staff the work of the junior scientists and technicians is of good quality , and only time and experience is required to improve the overall efficientcy.

JOB DESCRIPTION

Mr. Bernard Ivor Turtle

Title: Expert on Food Packaging and Processing

Period: November 16th to December 15th, 1985.

Activities: The expert will work with the technical staff of the Center, under the supervision of the Project Coordinator and the Director of the Institute of Food Technology - ITAL, to develop the following activities:

1. Short course to ITAL's Packaging Group (researchers and technicians) on the following food packaging topics:
   a) Shelf Life Testing for Plastics Food Packages.
   b) High Barrier Plastics Bottles.
   c) Sterilisable Rigid Plastics.
   d) The Report Pouch.
   e) Flexible Packaging Review.
   f) Aseptic Packaging.
   g) Polyester Bottles for Carbonates.
   h) Cans for Food and Beverages.

2. Critical evaluation and appraisal of flexible and semi-rigid plastics and aluminium containers for thermal processing in the following areas:
   a) Suitability assessment, quality control procedures, and laboratory equipment required.
   b) Range of plastics laminates suitable for thermal processing.
   c) Temperature measurements in flexible packages and semi-rigid containers.

3. Aseptic Packaging in flexible and semi-rigid containers. Development of laboratory procedures for experimentation. With special emphasis on the validation of sterilization processes for packaging materials.

4. Assist the Center staff in the area of new systems and technologies of food processing and packaging.

5. Prepare a final report in English on the above activities.

SHORT COURSE ON FOOD PACKAGING

During discussions with Mr. Luis Fernando Ceribelli Madi, the Project Coordinator, and Mr. Sylvio Alves Ortiz, Head of the Food Packaging Systems Group, it was decided that the short course subjects should be based solely on the expert's personal practical experience. Additionally, particular emphasis should be placed on the shelf-lives obtainable for foods in the wide variety of flexible and rigid plastics containers now available.

The general philosophy behind the subjects chosen by the expert were as follows:

Shelf Life Testing is fundamental to the establishment of shelf-life and is vital that it is carried out in a rigorous manner using the best available methodology.

The Report Pouch and Flexible Packaging are subjects in which CETEA already have an impressive in-depth knowledge. Nevetheless it was felt that much could be gained by a presentation of the recent European trends and experience in these areas.

High Barrier Plastics Bottles, Sterilizable Rigid Plastics, Aseptic Packaging and Polyester Bottles are four of the most important newly developing areas of packaging, but CETEA's current expertise in these fields is very limited.

Cans for Food and Beverages was chosen a) because a surprisingly large amount of can development is going on, and b) because a knowledge of can strengths, weaknesses, and trends will help to ensure that the development of sterilizable plastics containers follows the best route.

It was considered that these presentations would be of greatest value in the form of colloquia, ie "informal conferences or group discussions". That the colloquia were in fact so successful was largely due to the knowledge and enthusiastic participation of the more experienced people present. Total time spent was approximately 18 hours.

APPRAISAL OF FLEXIBLE AND SEMI-RIGID CONTAINERS

The Report Pouch

CETEA have a comprehensive knowledge and experience of the different laminate structures available world wide, and so most of the discussions centred on general aspects such as the need for outer cartons, abuse and transit testing, autoclaving procedures and quality control procedures. The expert was able to observe the processing of flaked tuna fish in 1 kg 110 X 300mm pouches and it was suggested that higher overpressures could well be required to prevent pouches bursting. An autoclave tray system allowing the vertical separation to be altered easily for different thickness of pouches was also suggested.

With regard to the use of non-foil pouches, a recommendation was made that the possibility of storing multipacks, say 10 retail sized packs, in an outer foil pouch until retail display should be considered. This could be a cheap way of extending shelf-life. Also the need to improve the drop resistance of catening sized packs should be investigated via the use of cushioning materials in the outer fibreboard cases. This would be more cost-effective than increasing the strength of the catering pouch laminate.

Semi-Rigid Foil Containers

Again CETEA have already gained much experience in this field via their evaluation of vinyl coated laminates produced by Alcan Brasil for airline meal trays. Also they have closing equipment from Alcan Ohler in Germany, and a staff member has visited manufacturing plants in Switzerland and Germany.

The proposed project for the evaluation of semi-rigid trays for heat sterilised foods was discussed in detail.

The expert was of the opinion that the experimental matrix to study all aspects of performance of 12000 containers in six sizes was well thought out and required no modification. The project would be Federally funded for two years, with renegotiation then to carry out shelf-life trials with real rather than simulated foodstuffs. Beanning in mind that Brasil manufacture is 3 - 4 years away, the time scale of the project to start mid-1986 is correct.

Recommendations were made that complete specifications of materials and container parameters should be obtained from Alcan Europe to help CETEA's evaluation study. It would be of advantage for an expert from the KIN Institute in Germany to come to CETEA to advise on processing aspects; however this would be of most value say 6 months into the Project when experimental results to that date could be discussed. A particular value of this work is that it would give CETEA the necessary expertise both to monitor the quality of Brasil made containers and also to ensure that the containers were sterilised and handled correctly by the food manufacturers.

Sterilisable Rigid Plastic Containers

This is an area which is becoming increasingly important, buth where Brazilian experience and knowledge is very limited. The subject was covered in the short course, and also arose during a second discussion with Alcan in Campinas. The main problems are the limited oxygen barrier of monolayer polypropylene and container wall collapse after hot-filling and or retorting. The former cannot be overcome until coextruded high barrier materials are available in Brasil or are imported, when at least one converter, ITAP, would be able to make containers. The distortability of even polypropylene with respect to heat was discussed in depth and the means of overcoming this by container design and autoclaving procedures explained.

It was recommended that as much experience as possible should be gained with hot-fill 85° - 95°C packs in the Brazilian food industry before the fully sterilisable containers were introduced. The expert will however try and arrange for samples of sterilisable autoclave containers from his company to be sent to CETEA so that processing experience can be built up as quickly as possible.

Temperature Measurements

There are no completely new techniques being introduced into Europe, only a refining of traditional thermocouple methods via microprocessor control, and more interest in datalogging devices for continuous retorts in particular. CETEA-ITAL are well aware of all the available methodologies and hence little time was spent on this subject. It was mentioned that Ecklund thermocouples and

heat penetration equipment had ahways been easier and cheaper to repair than Ellab; however modifications to the Ellab range now made it advisable to consider both companies for new equipment purchases.

PROCEDURES FOR ASPEPTIC PACKAGING VALIDATION

A 200ml size Tetrapak machine is available within ITAL for trials, and the system is established in Brazil. However, other aseptic packaging systems, apart from those similar to Tetrapak, are unlikely to be employed for some time. Hence studies on true aseptic packaging should be at a fairly low level of activity. Firstly to gain knowledge of the efficiency of the various sterilisation techniques used in the food industry and secondly to determine typical levels of microorganisms on the materials likely to be used for aseptic packaging in the future. The subject was discussed in detail and the methods of biotesting with Bacillus subtilis and Enterobacter cloacae described. The microbiological counts typically found on packaging materials in England and the need to keep contamination at low levels was stressed. A laminar flow cabinet is essential for this work and is also very useful for repacking of foods from existing containers into test packages, withouth subjecting them to a second heat treatment. It is preferable for CETEA to have their own cabinet rather than share with ITAL.

Though they are clean-fill operations rather than true aseptic packaging, the expert strongly recommended that CETEA should become closely involved with two industry projects to gain "pre-aseptic" experience. The first is the Nestlé/Yoplait blow--moulded containers for yoghurt, and the second the 1 litre high density polythene botle for milk. Monitoring of microbial counts on packaging, seal performance, temperature cycling experienced, and failure rates, is unlikely to be carried out efficiently without CETEA's help. This help could be particularly vital to the success of the milk project when this is upscaled from an easily controlled small marketing exercise to national or part national distribution. Both of these areas would provide very valuable experience, and also demonstrate the ability of CETEA to help Brazilian industry in the clean fill/aseptic packaging field and generally.

ASSISTANCE GIVEN WITH OTHER PROJECTS

1. The Canning of Water

Current practice is unsatisfactory in that severe internal corrosion is occurring within a few months, and so this project aims to demonstrate the flexibility of this pack given the correct canning procedures. Water is canned successfully in Europe for the armed forces and the procedure was outlined and discussed in the light of Brazilian water and cans. In essence, successful water canning demands well filtered good quality water having a low micro-organisms count, which must then be de-aerated by boiling to reduce in-can corrosion. Water must be filled into cans at 90°C with minimun headspace., which will produce an in-can vacuum of 22-25"Hg. Internally plain tinplate cans will give at least 1 year's shelf-life, but 3 years is normally achieved in Europe.

The planned experiments were discussed and recommendations made to concentrate on the welded can rather than soldered, make sure that double seams were of adequate tightness possibility needing extra lining compound, and to aim at the use of a plain rather than fully lacquered can since the latter was more likely to suffer perforation problems. The proposed use of internal spraying on bodies was not advised as lacquer residuals at the makers end periphery could give off-taste problems with a sensitive product like water.

2. Water in Retort Pouches

This project is mainly for CAFA, the Armed Forces Food Commission, though there is also an interest in survival kits for life rafts. Off-taste problems have been experienced and it was explained that a particularly low level of migration was needed since water was very sensitive to taint. However, currently produced standard RP-F material from USA or Europe should be suitable; the point was made that some taint must be accepted, albeit at a low level.

It was recommended that there was no need to use a full sterilisation process at 121°C, and use of the standard for cans procedure of hot filling at 90°C would be adequate to ensure shelf stability. The lower temperature would have the considerable

advantage of reducing the migration level and hence reducing the intensity of any off-taste produced in the water.

3. HD Polythene Bottles for Vegetable Oil

Tinplate containers are still the most important for vegetabl oils but the numbers of PVC bottles are increasing. This project aims to produce a 3L or 5L container which would be much cheaper than tinplate and therefore attractive to the catering and institutional markets. Since the shelf-life is unlikely to be more than 3 - 4 months it may not be acceptable in the retail area however. Off tastes have been experienced with the 1L bottles used for experimental purposes after only three days and the flavour panel rejected the oil after 15 days. The reasons for flavour changes such as scalping, oxidation, and migration were discussed at length in the light of experimental findings to date. The expert considers that the off-taste is likely to be a migration effect of low molecular weight polymer and or antioxidants or other additives, since the rapid onset of the taste makes oxidation or scalping unlikely reasons.

Recommendations were made on a short term experiment to prove whether the effect was indeed a migration one. This involved closewrapping the filled polythene bottles in plain foil to discount oxidation effects. These would then be compared witn normally packed HD bottles and cans. If migration is proved to be the problem then experiment should be repeated on the 5L size, as the reduced surface area volume ratio would reduce migration effects. It was also recommended that the effect of blowing clean compressed air through warmed bottles should be investigated, as the expert has previously found this to be of advantage in reducing off-tastes.

4. Metallisation Project

Metallised materials produced in Brasil are mainly used for decorative purposes at present. This work is aimed at improving the quality control during manufacture and evaluating the barrier properties of Brazilian materials. The various methods of evaluation such as resistorty, optical density, and gas transmission

rates by a factor of ten, due to flex cracking and adhesion loss of the aluminium metallisation.

It was recommended that correlations between metallisation coating weights and optical density should be treated with caution in view of the possible variations in coating thickness across the web of the laminates. The use of the Dynamic Morshine Meter was suggested for quality control, partly because of the speed of response compared to static methods for measuring moisture vapour transmission rates.

VISIT TO ALCAN SÃO PAULO

This visit was made on 27 November 1985 to the Alcan head office in Avenida Paulista in São Paulo. The expert accompanied Sylvio Alves Ortiz, Assis Euzébio Garcia, and Lea Marisa de Oliveira. The object of the visit was to discuss joint development work with CETEA in five different areas, and discussions on these took place with Arthur Cope, market development manager, and Maria Inês P. Martins, conversion processes and product development scientist.

Alcan has the smallest share of the Brazilian aluminium foil market, but is dominant in the supply of unprinted material, coated and laminated, particularly for milk can membranes and chocolate and cigarette wrapping. They have operated in Brasil for 35 years and so understand the market, and a particular strength is their complete access to world wide Alcan technology. Five projects were discussed, described briefly as follows.

Foil Retort Pouch

Alcan's retort pouch material is at present made in Toronto, where it has been approved for the Canadian armed forces. With regard to manufacture of the laminate in Brazil, Alcan can produce foil down to 7µ for packaging purposes. Polyester is available from Rhodiaco and several converters, including Toga and Shellmar could produce good quality laminate. At the moment the polypropylene resins available from Brazilian producers are not suitable for the inner ply, but neither are the converters able to produce gel-free film imported resin. For the immediate future film must

However the FDA approval of Isophonne di-isocyanate based adhesives means that most Brazilian converters can now make the retort laminate, which will increase the chances of introducing it successfully. Alcan promised to supply laminate made locally, early in the New Year, with some material also made into pouches in Toronto for CETEA to test.

Semi-Rigid Foil Containers for Sterilisation

We were told that current sales of these containers in Europe were 65M per annum. Only Alcan Roschach and Aluisuisse can make the laminate and Alcan Ohler are one of a number who can form the containers. Interestingly they were also being used in Germany for unit dose phamaceuticals as well as the usual range of entrees, hamburgers, rosti, etc. However while manufacture by Alcan in Brazil is being considered it would appear that the earliest possible date for starting is 3-4 years away.

Glass Lidding Foil

This project aims to replace an expensive metal cap by foil plus a simple plastic overcap. The expert has personal experience with British Alcan in this area and considers it to be a significant development. The first uses in Europe for liquid foods for yoghurts, jams, salad dressing and chocolate spread. Maximum heat treatment possible at the moment is around 90°C, ie a hot fill operation, but special treatment of the glass seal area is needed to achieve sufficient seal strength for hot filling. The expert suggested that CETEA should be involved in these developments because of the spoilag problems possible with pasteurised liquid foods. It is hoped that CETEA can participate in a proposed development between Alcan, Nestle and Cisper.

Heat Sealing Coating for Polypropylene

This is an Alcan developed coating for foil for lidding on polypropylene containers. They have found that increasing the coating weight from 5 to 9g.m^{-2} gives sufficient seal strength to withstand sterilisation. A joint development is already planned with CETEA with regard to clear polypropylene pots for hot filled

HD Polythene Bottles

Alcan think these may be a market in Brazil for milk sterilised in high density bottles. They have asked Alcan Technology Transfer in Canada for details of the manufacture of a suitable foil sealing material. The expert commented that most of the foil used for this purpose in England was coated with a special HD polythene from Retroplastique Total in France. This is an acrylic copolymer irradiated to promote cross linking and it seals very well on high density bottles.

Comments

The expert's previous experience of Alcan is that they are development oriented and always looking for new outlets for aluminium foil. Their worldivide Technology Transfer ensures that Alcan Brazil has excellent technical backing, even through a comparatively small company. Active cooperation between CETEA and Alcan would be beneficial to both parties, and in particular would help CETEA to gauge the needs of the Brazilian food industry in this field of interest.

GENERAL RECOMMENDATIONS FOR FUTURE WORK

Apart from the guidance given with specific technical problems summarised in the body of the report, the following general recommendations are made with respect to future areas of work. They are not necessarily listed in order of importance, since only the management of CETEA-ITAL has the in-depth knowledge of the Brazilian situation required to assess priorities. Nevertheless, the expert strongly recommends that some effort at least should be put into all of the following activities. It should be noted that the resource of experienced scientists within CETEA may however be insufficient to do this.

1. Continue work on the retort pouch, but with increased emphasis on catering/institutional sizes and pouches for the armed forces.

2. Commence work on field transit tests of fragile packages in outer fibreboard containers, and relate these to laboratory abuse test procedures. A Gaines case drop tester should be purchased as soon as possible and data logger shock recordess and vibration testers in due course.

3. Make studies on the quality deterioration of fruits transported in wooden boxes. Enlist the help of the outer fibreboard carton manufacturers to introduce improved packaging.

4. Improve and maintain background knowledge on PET bottles and Lamicon high barrier bottles.

5. Evaluate the performance of currently available sterilisable rigid plastics containers, with particular reference to their distortability characteristics on hot-filling and autoclaving.

6. Build and maintain a computerised database, from the results obtained in CETEA, on the shelf lives of foodstuffs in various forms of packaging.

7. Commence the sterilisable semi-rigid foil container Project by mid-1986.

8. Increase background knowledge of aseptic packaging technology and materials suitabilities. Become involved in clean filling

A laminar flow cabinet is essential for this work and CETEA should have their own equipment. Sharing with the ITAL cabinet is not desirable due to cross contamination hazards.

9. The final recommendation is that while independent scientific studies must continue, CETEA should more actively seek to demonstrate its great potential value to industry. This can be achieved by increased cooperation with packaging suppliers and food companies, and the semi-rigid aluminium container and the plastic milk bottle are ideal examples of this. Mutual interests with industry will produce symbiosis and give greater impetus to development work. Cooperation will also help to ensure that chosen projects have the best chance of a successfull outcome.

ANNEX I

PARTICIPANTS IN SHORT COURSE ON FOOD PACKAGING

Sylvio Alves Ortiz

Assis Euzébio Garcia

Claire Isabel G. de Luca Sarantópoulos

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ANNEX II

SYNOPSIS OF SHORT COURSE ON FOOD PACKAGING

1. Shelf-Life Testing for Plastics Food Packages

Three main areas were convered as follows. Packages Testing reviewed the main drop, vibration and other abuse procedures, and stressed the importance of relating these to use in industry. Biotesting techniques relative to sterilizable and aseptically, packed containers were explained. Foodstuff Testing dealt with the main organoleptic evaluation techniques, and the 6 point scale methodology. Finally, Accelerated and Theoretical Testing showed the inadequacy of these techniques at present but stressed the need for continued work in this area.

2. High Barrier Plastics Bottles

The basic materials structure and manufacture of these coextruded bottles was described, and the means by which high barrier to oxygen was achieved. The shelf-lives of a range of cold and hot-filled products in the Lamicon or Gamina bottle were given. General advantages and disadvantages were discussed, together with the recent successful launching of Heinz Tomato Ketchup in the USA.

3. Sterilizable Rigid Plastics

Mainly described with reference to the Lamipac polypropylene coextruded barrier container with foil lidding. Materials, manufacture, filling, and sealing were described. Particular emphasis was laid on the 'Tor' patent method of vacuum sealing and the balanced pressure profile conditions needed to autoclave some high air packs. Shelf-lives were listed for various foods. Finally American Can's Omnican and the Multi therm process were stressed as important developments.

4. The Retort Pouch

European experience was highlighted in three main areas. Materials described how these had evolved to the current optimum laminate specification via problems of off-flavours, sealing ply quality,

and insufficient manufacturing control. The need for continual independent evaluation of materials by Institutes such as CETEA was emphasised. A typical specification succesfully used in Europe was given. Secondly the general well known principles of sterilization, handling and shelf-life were discussed and the need for "safety factors" in the food industry mentioned. Finally, the expert's personal opinions on the reason for the lack of success in Europe were given. These were largely cost, comparison with frozen rather than canned foods, and lack of consumer perception of the real advantages of the retort pouch. However there was a real future for the retort pouch with the armed forces, institutional catering packs, and also vending outlets.

5. Flexible Packaging Review

Emphasis was laid on materials because of the infinite range of properties available by lamination. The importance of coextrusion multilayer structures was emphasized, particularly where aluminium foil could be replaced by cheaper structures giving adequate shelf life performance. The bag-in-box and other liquid holding structures were shown to have an important future, and in general flexible packging used for foodstuffs was set to increase steadily over the next decade.

6. Aseptic Packaging

The basic procedures of aseptic packaging, ie product UHT sterilization, package sterilisation, and filling under sterile conditions, were explained in some detail. The evolution of aseptic packaging for plastics materials was shown to be linked to the development of the hydrogen peroxide,hot air sterilisation system, which did not demand high heat resistance containers. The practical reasons for the widespread use of hydrogen peroxide rather than other sterilisation methods were outlined. However the drawbaks and need for very close control over this method were emphasized. Sterility levels achieved in plants in Europe were discussed for the various types of installation; the comparative inadequacy of these levels being the reason why only high acid or milk products were packed, so as to avoid a food poisoning hazard. Finally three important techniques were

discussed and explained in detail. a) Tetra Pak in its various forms of Tetra Brik, Tetra Rex, Tetra King, etc. b) The Metal Box Freshfill system which enables pre-formed plastics containers to be aseptically packed and c) The Continental Can Conoffast thermoform fill seal aseptic fill seal aseptic system; this has the ingenious concept of using coextruded laminates where a discard layer is removed to expose a sterile layer, thereby removing the need for package sterilisation at the time of filling. The expert considered that aseptics was a very important growth area world wide.

7. The Polyester Bottle for Carbonates

One of the most important new forms of packaging seen in the last 20 years, the market in Europe, USA, and Australia has grown from nothing in 1977 to approximately 4,000 million bottles in 1985.

The 2L and 1,5L sizes predominate as the glass container is leavy, expensive, and difficult to handle in these larger sizes. Methods of achieving the orientation which gives the bottle its unique properties were outlined, and the evolution of the various base forms explained. The vital area of CO_2 loss and the mechanisms of this loss via creep expansion, sorption and permeation, were explained at some length. Finally shelf-life performance was shown to be due mainly to CO_2 retention with soft drinks but due to oxygen barrier with lager beers and wines. The development of PVDC coatings to achieve the required oxygen barrier was outlined. This will extend the market potential very considerably, particularly as it allows the use of smaller bottle sizes having an adverse surface area to volume ratio.

8. Cans for Food and Beverages

The very considerable amount of development work to produce better and more varied metal containers was discussed. In particular the 3 piece welded can, and the 2 piece drawn containers which are available in a much greater variety of height to diameter ratios than the 3 piece cylindrical can. Also the rectangular forms such as the food tray for

Easy opening ends would be more widely used in the next 2-3 years, and many would be based on plastics metal combinations; various types were described. Finally, emphasis was laid on the fact that the can was the pre-eminent container for sterilised long-life foods, and would remain so far the foreseable future.

ANNEX III

SELECTED LITERATURE AND DATA LEFT WITH CETEA

Literature

1. High Barrier Films. Anon. European Plastics News, August 1985.
2. Coextrusion for Packaging. Anon. European Plastics News, September 1985.
3. Metallised Films and Coated Foils. M. Koschak. (Source unknown).
4. Aluminium Foil Pinholes. A.R. Lott. Packaging Technology, August 1974.
5. Package Selection - Product Considerations. H.B. Chin. (Source unknown).
6. Selecting Flexible Packaging. P.Latiner. Food and Drug Packaging. June 1983.
7. Fast Heating Better Flavour. Anon. Packaging News, 1984.
8. Multithermand Achilles. Anon. Packaging Review, November 1983.
9. Applications for Multitherm. Anon. Packaging Strategies, April 1985.
10. High Performance Plastic Packaging for Foods. S.A. Jabarin. Food and Drug Packaging. October 1983.
11. Barrier Properties of Polymeric Materials. R.W. Fox. (Source unknown).
12. Evaluating Container Integrity Through Biotesting. D.T. Bernard (Source unknown).
13. QC Test Procedures for Seal Integrity. T.W. Downes (Source unknown).
14. Retort Pouch Production of Shelf Stable Foods. A Przybyla. Prepared Foods, May 1984.
15. The Conoffast System. Anon. Prepared Foods, January 1983.
16. Packaging Materials for Aseptic Foods. G.L. Robertson. Food Tech. NZ. February 1983.
17. Aseptic Packaging Machine Design. R.J. Kelsey. Technical Engineering. February 1974.

19. Coextruded Sheet and Aseptically Packed Foods. L.J. Bonis. Ryder Symposium 1984.

20. Controlled Atmosphere Packaging. Anon. Packaging Today. May 1985.

Data

1. Lamipac Systems Brochure.
2. Table of nutritional value of canned foods.
3. Lamipac Heat Sealing and Quality Control Testing.
4. Lamicon High Performance Plastics Containers.
5. Metapak RP-F Specification.
6. RP-F Test Methods, 1980.
7. Code of Practise for Retort Pouch Handling.
8. Criteria for Retort Pouch Seals.
9. Graph of OTR of metallised materials on flexing.
10. Blown film extrusion diagram.
11. Organoleptic scoring scales for foodstuffs.
12. Graph of light transmission versus shelf life.
13. Typical Biotesting Procedure for Cans and Plastics.
14. Table of shelf lives of foods in Lamicon.
15. Eval moisture sensitivity graph.
16. Graph soya oil in plastics bottles versus peroxide values.
17. Table, container sterilisation methods, Aspetic Packaging.
18. Diagram Freshfill aseptic pot filler.
19. Graph flavour change lager beer in PET bottles.
20. Typical PET bottle specification for lager beer.
21. Melinar ICI information on gas permeation through PET bottles.
22. Table, strengths of the metal food can for sterilised foods.
23. Diagram of Jupiter for aseptic solid foods.