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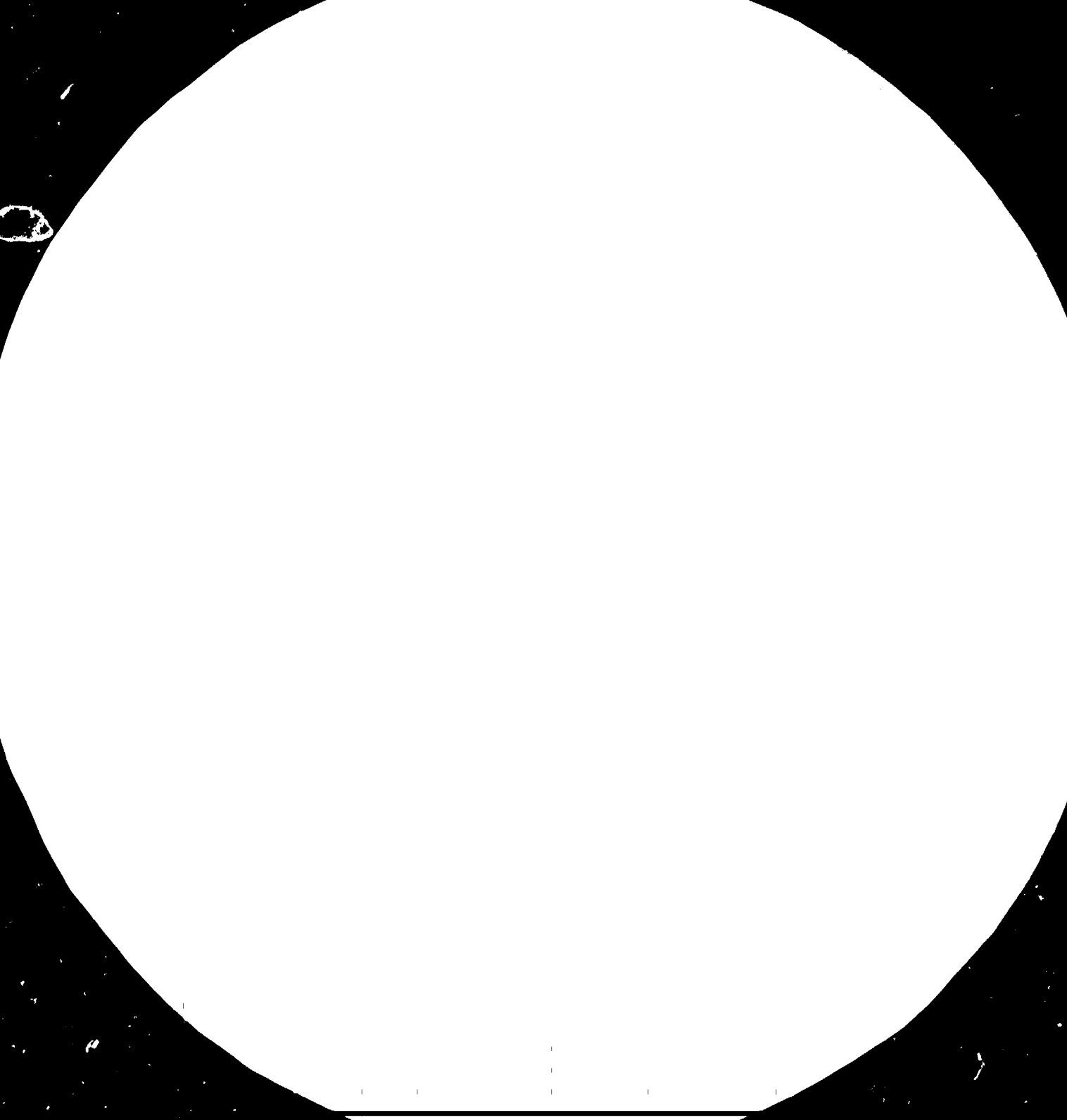
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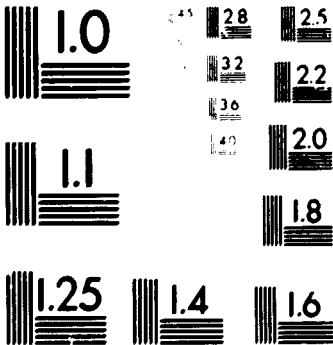
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CONSOLIDATION OF CAPACITY OF INSTITUTE OF FOOD
TECHNOLOGY THROUGH CREATION OF A NATIONAL
FOOD PACKAGING CENTRE

DP/BRA/82/030

BRAZIL .

Technical report: Laboratories of Food Packaging Paper,
Carton and Fibreboard*

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 Markku Nissilä, Expert in Paper, Paperboard
and Corrugated Cases

United Nations Industrial Development Organization
Vienna

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ABSTRACT

Key words: paper, paperboard, corrugated board, food packaging, quality control, laboratory, training, visits to industry.

During three weeks the expert trained the personnel of the Packaging Center (ITAL/CETEA) in paperbased packaging materials. Existing laboratory equipment were checked and the use was started. Visits to the paper and packaging industries were made to evaluate the capability of material suppliers and to show to the trainees some manufacturing details.

The benefits of international contacts are clear. However it is highly recommended to the Packaging Center to increase language training as an investment to the human resource. Some additional investments are also recommended to the laboratory. Public relations to the industry and strengthening of co-operation with the development activities in the country should be continued. Recommendations concerning sensory evaluation tests and transport trials of fruits and vegetables are made.

1. INTRODUCTION

1.1. Project Background

The importance of packaging is remarkable in the Government's endeavour to increase and ensure sufficient food supply to the Brazilian people. Furthermore, it is very important to alleviate Brasil's Balance of Payments problems by increasing export of processed foods. Here the role of good packaging is dominant.

The Institute of Food Technology (ITAL) in Campinas, São Paulo, is the main institution addressing the issue of packaging and has undertaken to create and operate a Packaging Centre (CETEA) with the support of the Federal Agricultural Ministry and State Agricultural Secretariat. At the moment the Packaging Centre comprises of 16 graduate specialists (B.Sc.), 15 technicians and 5 of general supporting staff.

National Expertise in some special fields is limited and international technical assistance is being requested to ensure that Packaging Centre will have a modern and appropriate technical knowledge.

The main objective of the Food Packaging Center is to up-scale support to the packaging and food industry in Brasil

1.2. Objectives of the Mission

Because of expertise in paper-making and manufacture of corrugated board, the main objectives were specified as follows:

1. Short courses related to the types of paper, carton and corrugated board, their quality control and development work specially in the food packaging industry.

2. Appraisal of the laboratory equipment already available in the Center.

3. Training of the personnel on the laboratory equipments.

4. Visits to the paper and corrugated board industry, to the food packaging industry and to the users as a part of the training program.

5. Technical assistance to the industries regarding the tendency of the paperboard and corrugated board together with the personnel of the Center.

1.3. Training

Due to little advance information about the Level requirements for the training course it was concentrated on the principal and fundamental facts about paperbased packaging.

The program for internal seminars is listed in the Appendix I.

The main emphasis of the training program was related to the types of paperbased packaging materials in the food packing industry and to the development work of those qualities.

As a part of the training program some visits to the industries were made.

The language of the Seminars was English, but some condensations were given to the technicians in Portuguese by the people of the Packaging Center.

2. DESCRIPTION OF THE WORK PERFORMED

2.1. Introduction

The expert worked with the technical staff of the Center under the supervision of the Manager of the Project.

This was the first contact and in the beginning an evaluation about general knowledge of paperboard packaging was needed among the staff to be trained.

May be due to insufficient skill of spoken English among majority of personnel, the estimate was difficult to make. Any way there was much variation in comprehension of technical English. This affected the content of the Seminars. The subjects were handled in a simplified way and categorically.

The general procedure for a three weeks visit was well organized by the Manager of the Project. Visits to the industry were useful and valuable.

The laboratory of the Packaging Center was still unfinished and due to lack of standard conditioning in the laboratory no real calibrations of existing equipments could be made. Also the lack of sample cutters is evident. Only the general operation was checked.

2.2. Job duties

2.2.1. Short courses and internal seminars

Altogether five seminars were held during two weeks' period. Because there was no specific requirement in advance, the expert had to prepare the courses in the duty station. This took a considerable share of the time spent at ITAL. In the first seminar a brief introduction to paper making was given before a detailed list of different papers and paperboard was gone through. Some more detailed printed information was left in the Center. The second seminar handled the manufacturing of corrugated board and converting of boxes.

In the third seminar quality control of corrugated board and box specifications were inspected. This was the special subject to the expert and some latest information

concerning trends in the box performance evaluation was given.

The fourth seminar handled general principles of packaging, practical approach to the development of paper based packaging and different papers and paperboards in food packaging. This seminar was more active than the previous ones. The last seminar dealt with transport and standardization.

As mentioned before the language problems took away some of the activity expected by the expert. More questions would have helped to evaluate specific needs for further training.

The personnel is relatively young and has a good theoretical background, but needs more practical contacts to the packaging industry to see their daily problems. Appropriate visits in combination with the course should be used also in the near future.

In all the training under these circumstances needs a long time. The planned program to send some of the technical staff abroad should be absolutely carried out.

All the transparent material used in the seminar program (Appendix I) was copied and left for the use of the Center.

2.2.2. Appraisal of the laboratory equipment

After seeing the new laboratory with some new equipment the expert was astonished by the lack of appropriate conditioning of the laboratory atmosphere. No comparative tests can be made in variable conditions. Another remarkable finding was the shortage of sample cutters. With tests related to corrugated board a most important factor is to have properly cut samples.

The complete list of laboratory equipment is given in the Appendix II.

Because of the above shortages only the proper operation of the equipment was checked.

However, Mullen bursting strength values and some results of Crush Tester were compared with the similar samples in the official laboratory of IPT.
(Institute of Technological Researches)

For training purposes a procedure to evaluate the box compression strength was shown according to the standards known in the European countries. This procedure does not need assisting tools.

However, all the tools needed to meet ASTM - Standards should be available.

A more detailed estimation for the use of the laboratory was made together with the staff.

2.2.3. Visits to the industries

Altogether six different visits were made to the paper, corrugated board and packaging industries with the technical staff of the Center. Separate visit reports to Klabin, IPT, Rigesa, CICA and Suzano are attached in Appendix III. A Special visit to the fruit and vegetable wholesale market (CEASA) was made to evaluate the changes of corrugated boxes in taking possession of wooden boxes in some extent. No doubt there is place in this field for corrugated board.

The paper industry in Brasil has developed well and the international help has been valuable. A special feature in the Brazilian paper and pulp industry is the high proportion of eucalyptus. Properties of paper has much potential and for example the linerboard has excellent Stiffness values, which interest European markets very much, of course, the price plays the most important role.

The corrugated board industry has developed slowly compared with the European industry.

Generally the productivity is low, machinery and process development 5-10 years behind the European industry.

Raw materials are fairly good, but general appearance of the combined board and box performance properties could be improved by better converting.

For export packaging only first class raw material should be used. In principle the best performance properties are reached with kraftliner and Semichemical fluting. Generally the most economical way to increase the moisture resistance properties is the use of high gramage raw papers, but under those climatic circumstances all board treatment possibilities should be studied. Wax emulsions are plenty and new developments are introduced continually.

Corrugated board industry should participate more strongly to the total packaging and transportation planning. Automatic packaging machinery will set new standards to the board quality.

Efforts should be made to create standard specifications of qualities to the packaging industry.

Packaging industry as the user of corrugated boxes should ask for better box performance, improved tolerances and control manufacturing faults.

2.2.4. Other technical assistance

Apart from the main duties, some sensory evaluation tests were made on an informative basis. Taste and odour problems of food packaging materials have become more essential in the European countries. It may be good to be prepared to answer inquiries from Brazilian packaging industry or consumers. Information was also given about the use of gas-chromatography in this connection.

Also some box strength calculations were made and some supporting information concerning tomato transport trials was given.

Material concerning standards and methods to test paper, paperboard and corrugated board was left in the Packaging Center. Additional information about moisture resistant corrugated board was given to the Center.

3. FINDINGS AND RECOMMENDATIONS

Most of the findings have already been mentioned in the previous connections, but here are listed in brief the most essential recommendations related to the further development of the existing resources in the Packaging Center of ITAL.

3.1. Training

Basically the chosen policy to use international help in consolidation and training of the human resources is correct. However the language problem should be faced seriously. One solution could be a consistent language training in small level groups dealing with professional subjects in the packaging field.

Advance in English should lead to international contacts.

Otherwise contacts and visits to the Brazilian packaging industry should be used as much as possible.

3.2. Laboratory

The laboratory space is proper and there are the most important devices needed at ITAL. However, sample cutters and accessories to test corrugated board should be bought. The most important additional investment should be the air conditioning to the standard atmosphere (now 20°C and 65% RH).

3.3. Relations to the industry

Unfortunately the time was too short to work out any inquiries from the industry concerning paperbased packaging, but the Packaging Center should increase its knowledge on some specific, selected area of paperboard packaging. This could be something where the whole ITAL's possibilities are used.

Another unfinished duty was arrangements for an external seminar.

This needs time, but is highly recommended to be organised by ITAL.

Mutual benefits could be reached if development people from the industry bring their views to this seminar.

3.4 Other recommendations

In creating industrial standards and good manufacturing practise to fulfil the demands of food packaging, cooperation is needed to draw up qualifications for food packaging materials. In some developed countries even sensory evaluation tests are used to finalize the demands. Here the natural counterpart is the food packaging center. Usually there are existing capability to make these tests.

Also at ITAL the general procedure should be estimated and test.

Another area of co-operation is in evaluating transport damages of fresh fruits and vegetables. The product knowledge is essential in evaluating performance of different packaging materials in transport trials. A natural leading role in those projects should be achieved by ITAL in consequence of high knowledge about products in question.

APPENDIX I

**CURSO BÁSICO SOBRE EMBALAGEM DE PAPEL E PAPELÃO
PARA PRODUTOS ALIMENTÍCIOS**

5 aulas de 2,5horas

Markku Nissilä
Consultor do CETEA

- 1) 22/11/83 - 9:00 - 11,30 hs
"Princípios básicos sobre fabricação de papel"
"Principles of paper making and different qualities"
- 2) 24/11/83 - 9:00 - 11,30 hs
"Fabricação de papelão ondulado"
"Manufacturing of corrugated board"
- 3) 25/11/83 - 9:00 - 11:30 hs
"Controle de qualidade de papel e papelão ondulado"
"Quality control of corrugated board"
- 4) 01/12/83 - 9:00 - 11:30 hs
"Embalagem de papel para alimentos"
"Paper and paperboard in food packaging"
- 5) 02/12/83 - 9:00 - 11:30 hs
"Embalagem de transporte e padronização"
"Transportation and standardization"

APPENDIX II

APPARATUSES IN THE PAPER LAB OF ITAL

1. MULLEN BURST-TESTER
Model MT/M e MT/Mot
2. CRUSH TESTER (Reqmed)
Model CT-400 KgF
3. COBB TESTER (Reqmed)
4. STIFFNESS TESTER (Taber/Reqmed)
Model R1 - 5.000
5. POROSITY TESTER (Gurley)
Model PGH/PGH - T
6. FOLD TESTER (Kohler - Molin)
Model DF-200
7. CARTON CREASER (Pira)
8. TEAP. TESTER (Elmendorf)
Model 1600
9. BRIGHTNESS AND OPACITY TESTER (Reqmed)
Model UP/AL - 73
10. CALIBER TESTER (Reqmed)
Model ESP/SA
11. BREAK TESTER (Reqmed)
Model Dinamometro RE-A/30

APPENDIX III₁

VISIT REPORT TO IPT

by Lucia Guedes and
Markku Nissilä

DATE AND PLACE: 23.11.83, São Paulo

PEOPLE MET FROM IPT: Mr. Ernesto Pichler
Ms. Silavia Bergman

PURPOSE OF VISIT

To evaluate the possibilities of IPT in laboratory studies of transport box performance and the possibilities to extend those studies to paper properties.

Another purpose was to compare some test results from ITAL.

COMMENTS

The Knowledge about box performance in transport was on a high level. A lot of work has been done to find correlations between field studies, lab performance and individual board properties. The information and Knowledge from IPT is valuable for ITAL in their studies.

Mr. Ernesto Pichler is now working on mathematical models for box performance and is developing an apparatus for measuring bending stiffness of board.

The equipment to simulate transport vibration, drop tester and development idea to improve box compression tester were excellent.

The Mullen testers in packaging lab and paper lab were not in calibration.

Paper lab mullen was used to check results from ITAL.

average (ITAL) 3,3 kPa

average (IPT) 2,9 kPa (- 10%)

Samples were transported in a plastic bag, but may have changed in moisture.

To measure ECT-value ISO - standard was unknown, so comparison is of no value.

In the Pulp and Paper Research department a lot of work has been done to compare different fibre sources. Specially studies on eucalyptus are valuable. A pilot plant to study thermomechanical pulping is well equipped.

Analytical paper studies could be useful to ITAL in the near future.

VISIT REPORT TO KLABIN EMBALLAGE

by M. Nissilä and

Lucia Guedes

DATE AND PLACE: 23.11.83, São Paulo

People FROM KLABIN: Paulo Peres, production mgr
corrugated box plant

Timo Hyrylä, industrial dir

Kraft liner mill

I GENERAL DESCRIPTION:

Conventional, old-fashioned box plant with two corrugators, one in-line machine, two flat-bed diecutter, one rotary diecutter, two printer-slotter, two semi automatic stichers, one four -point-gluer and hand stichers. Total output in three Shift about 4000 tn/month or 7 million m²/month.

The share of double-double board was 15% and the share of microflute (E) was 5%. The main quality was C-fluted double-faced board (about 80%). Diecutted 15%, total waste 15%. Factory uses as raw material 95% of testliner from their paper mill and 5% Kraft liner.

As corrugating medium both semichemical fluting and waste based medium was used. Raw material quality was very good. Generally taken the factory lay-out was poor with too small sheet-storage after corrugator and converting capacity was unbalanced with two corrugators. A read bottle-neck was in bundling and packaging operations.

This unbalance is not good for the product quality - uneven flow causes warpage and affects dimensions and tolerances of boxes. Generally quality control was organised, but the use of results could be better or more random checking on finished goods would be required.

II MACHINERY

- 1 S&S corrugator, 220cm wide, B-and C-flute
- 1 S&S corrugator, 160cm wide, B-and C-flute
 - + E - flute rolls
 - Wax-application
- 1 ward diecutter (rotary) with 2 colour units
- 2 S&S - flat bed diecutter with 2 flexo units
- 2 Peters printer slotters
- 2 Bostitch stitchers
- 1 four-point gluer
- 1 curtain coater for waxing
- 1 Ampak - bundling machine

AUXILLIARY EQUIPMENTS

- die making equipment for rotary and flat bed
- printing-die equipment (based on rubber)
- model making equipments
- laboratory equipments (mullen, crush tester, concora)

III QUALITIES

- Papers: liners 120 g/m², 140, 160, 180, 200, 300, 420
 - flutings 110 g/m², 120, 150
 - new development Eucaliner (duplex, semichen)
- Board: for exemple C-flute 160/120/160
 - much unbalanced qualities, like 120/110/140
 - very heavy BC- qualities, like 420/150/420/150/420
- Board quality:
 - generally flat
 - strong in column crush test
 - tolerances for internal dimension 2-4mm

IV REMARKS

The new Eucaliner an interesting Brazilian testliner with high crush values (ring crush). This development was discussed in details by Hyrylä/Nissilä.

Also details in designing transport package for tomatoes were discussed by Lucia Guedes and Klabin designer..

All together visit was useful in evaluating possibilities of Brazilian Corrugated industry.

VISIT REPORT TO RIGESA

by Lúcia Guedes
Gina Quirino
Claire Sarantopoulos
Sílvia T. Dantas
and Markku Missilä

DATE AND PLACE: 25.11.83 - Valinhos

PURPOSE OF VISIT

As a part of the training program to see the practise of paper-making and manufacture of corrugated board. For the expert the visit offered a possibility to survey the level of board manufacturing in Brazil.

GENERAL DESCRIPTION

In its entirety the operation was impressive specially the production figures of the corrugated board factory were very high compared with any other box plant operation. Combined with their own corrugating medium manufacturing the economical result must be very good.

The paper mill uses only waste-fibres as their raw material.

The box plant is may be the most advanced in Brazil, but in an international comparison it is considered to be in the middle-class.

The corrugators are up-to-date, but converting and specially material handling are behind the general development. The plant layout was complicated, but there was place enough to make possible the high production.

The quality of combined board was good after corrugation, but some of the box strength was lost in the converting due to variations in the slot depth and due to the unsquareness of the box. Also a low-grade corrugating medium is sensitive to moisture and box strength weakens easily.

It was interesting to notice the development at moisture resistance board. This is extremely good trend in Brasil, where the high relative humidity weakens the board.

Generally the quality control was well organized and the development of the process and new qualities has been successful.

MACHINERY (main components)

2 Paper machines in the paper mill

2 Corrugator, width 220cm (with wax applicatiors)

. BHS with B and C-flute unit

. S&S + BHS C-flute unit

3 In-line machines

. Sunds - Emba, flexo-folder-gluer

. S&S

. Simon

3 printer-slotter

1 flat-bed diecutter, S&S

1 rotary diecutter, Ward

1 curtain coater (wax)

APPENDIX III₄

VISIT REPORT TO CICA

By Lucia Guedes
Claire I.G. de L.Sarantopoulos
Eloisa E.C. Garcia
and Markku Nissilä

PEOPLE FROM CICA

Ms. Rosa M. Vercelino
Mr. Humberto

THE PURPOSE OF THE VISIT

To see the packaging practise of a big food processing factory. A special attention was paid to the transport packaging. However the whole process was examined.

GENERAL

CICA is one of the biggest Brazilian food industry. It produces, like tomato paste, tomato puree, tomato-sauce, ketchup, etc. They also produce maioneze, other condimentos, marmelades and other canned vegetables and fruits, like peas, mixed vegetables, peaches, etc.

The packaging materials used to pack these products are tin plate cans, glass jars and some plastic materials. Tin plate cans are largely utilized for marmelade and tomatoes products.

All the take offs from the machines are manual where a high number of employee is necessary. The industry has one half automatic filling-closing machine to pack tomato paste in 140g cans, which is its biggest commercial product. CICA also has a form-till-seal machine to pack marmelade products in PVC pack by the deep-drawn process.

The percentagem of packaging materials used by CICA is about:

cans - 80%
glass - 9%
plastics - 1%

paperboard and corrugated board - 10%

The tendency is to increase the utilization of different can materials and plastic packs for small portions.

REMARKS

The packaging costs, which vary from 30% to 70% of product's selling price, are very high and represent the most essential share in the economy of this enterprise. Naturally the low price of tomato paste and canned fruits and vegetables explains the cost structure, but generally the proportion of packaging costs is considered to be high between 20% and 50%. The degree of automation plays an important role in these comparisons.

Transport packages in corrugated cases were ordinary RSC - style and the quality mainly light weight B - flute. For glass jars C-flute was used. In case of tin cans and glass jars the content is to take the response of stacking strength in loading, so it is extremely important that boxes have specified measure tolerances.

As to the quality control CICA had in their laboratory Mullen - and Crush Tester to check material specifications. However performance specifications i.e. stacking strength, manufacturing fault and measures were not followed regularly.

CICA uses their boxes twice, because their tin can and glass jar suppliers send empty packages in the same transport cases.

Because of differences in empty and filled cans the fillings and tolerances should be checked more carefully. Bulging was easy to notice on the bottom of pallets.

The cost share of corrugated boxes was about 10%, but doesn't doubtfully contain costs of damages.

The size of pallet was 1100 x 1100mm which is a standard in Brasil. A general advise to the Brazilian export industry

is to be prepared to handle two standard pallet sizes ie. 1100 x 1100mm and 800 x 1200mm.

The quality of transport pallets for the export market must be extremely good in stacking stability, which is research by a proper unitizing.

The lack of good strapping machines for tying the load onto the pallet is evident.

The quality of board for export markets is may be improved in the most economical way by using first class raw material with increased grammage.

VISIT REPORT TO SUZANO

By Lucia Guedes
Gina M.B. Quirino
Eliana Ribeiro da Silva
and Markku Nissilä

TIME AND PLACE: 06.12.83 Suzano

PEOPLE FROM SUZANO:

Joaquim de Toledo Neto
Franco Rosso
João Tadeu M. Attuy

GENERAL

Suzano is one of the biggest paper mills in Brasil. They produce many different paper qualities only from eucalyptus pulp. The pulping capacity is about 1000 ton/day. The process is based on sulphate chemicals and the yield from eucalyptus is 52%. The chlorite bleaching is used to 60% of the pulp. Eucalyptus fibres are very uniform and give a good base to the paper.

In the old paper mill are paper machines number 1, 2 and 4. This part was not visited.

The new paper machines 5,6 and 7 are fairly modern and production figures are relatively high.

PM 5 (Beloit-Karhula) is 370cm in width and produces coated printing papers for off set printing. The grammage varies from 60g/m² to 140g/m². The coating is 15g/m² or 12,5g/m², when both sides are coated.

PM 6 (voith) is 450cm in width and produces 3-ply paperboards with grammage 200-500g/m². The running speed is 180m/min and the total annual production is may be biggest in the South America. The paperboard structure consists of three Fourdrinier webs. No groundwood is used and the stiffness is reached by eucalyptus short fibres.

PM 7 (voith) is a twin-former machine with 470cm wires. The running speed of 800 m/min could be reached. The qualities are writing and printing papers.

Off-machine coater (voith) has 2 coating stations with trailing blade coating.

The mill has 2 supercalenders

Paperboard and some special wrapping papers are supplied to the food processing industry.

One development target is to improve the stiffness of folding boxboards (duplex).

Qualities and quality control

The paper qualities are simplex, duplex and triplex carton, all coated or uncoated.

They also produce writing papers for the home and export market. Some examples are listed below.

Paper: symetrique III, with the grammage from 75-180g/m²
couché BS, with the grammage from 75 - 125 g/m²

carton - DR carton used for packaging with the grammage
from 250 - 500g/m²

cartão supremo - also used for food packaging. Grammage
from 200 - 450g/m²

In the quality control laboratory they test grammage, thickness, opacity, Cobb test, and all the most important tests on paper to evaluate the mechanical characteristics including stiffness. They don't do any work to solve migration or off-dour problems.

the 1990s, the number of people with a disability in the United States has increased from 35 million to 55 million (U.S. Census Bureau 2000). The number of people with a disability in the United Kingdom has increased from 10 million to 15 million (Department of Health 2000).

As a result of the increase in the number of people with a disability, the United States and the United Kingdom have both introduced legislation to protect the rights of people with a disability. The Americans with Disabilities Act (ADA) was passed in 1990 and the Disability Discrimination Act (DDA) was passed in 1995. The ADA and DDA have both been successful in increasing the awareness of people with a disability and in reducing the discrimination against them.

However, the ADA and DDA have not been successful in increasing the employment of people with a disability. In the United States, the number of people with a disability who are employed has increased from 10 million to 15 million (U.S. Census Bureau 2000). In the United Kingdom, the number of people with a disability who are employed has increased from 2 million to 3 million (Department of Health 2000).

The reason for the increase in the number of people with a disability who are employed is that the ADA and DDA have been successful in increasing the awareness of people with a disability and in reducing the discrimination against them. However, the ADA and DDA have not been successful in increasing the employment of people with a disability because the ADA and DDA have not been successful in increasing the awareness of employers and in reducing the discrimination against them.

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