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STRENGTHENING OF THE TECHNOLOGICAL CAPABILITY
OF THE THAI PACKAGING CENTER
DP/THA/87/019
THAILAND

Technical report: Paper and Board Testing*

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

Based on the work of John Salisbury,
expert in paper and board

Backstopping officer: J. Belo, Engineering Industries Branch

26

United Nations Industrial Development Organization
Vienna

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ABSTRACT

This report deals with the testing techniques used in a paper and board laboratory including Bendsten Smoothness & Porosity, PIRA Crease Stiffness, Elmendorf Tear, PIRA Rub tester, Cobb test, Mullen Burst (Paper), Mullen Burst (Board) and Taber Stiffness. The importance of preparing detailed TEST PROCEDURES for each piece of test equipment in the laboratory is emphasized and illustrated.

Table of contents

	Page
ABSTRACT	
I. INTRODUCTION	1
II. DESCRIPTION OF THE MISSION	1
III. OBSERVATIONS AND CONCLUSIONS	1
IV. RECOMMENDATIONS	5
ANNEXES	
ANNEX 1 Principle contacts made	7
ANNEX 2 Terms of Reference	8
ANNEX 3 Visit Report, Thai Union Paper Co.	10
ANNEX 4 Example of a Paper & Board TEST PROCEDURE	12
ANNEX 5 National, Regional and International Test Methods.	19
ANNEX 6 Backstopping officer's comments	24

I. INTRODUCTION

The purpose of this UNIDO mission was to strengthen the capability of the Paper and Board Laboratory at the Thailand Packaging Centre, with respect to providing a testing and technical advisory service to local industry.

II. DESCRIPTION OF MISSION

The Consultant left UK on Sunday 9 September 1990 for Thailand and arrived Bangkok on Monday 10 September 1990.

The mission focussed on the use and applications of the test equipment already installed in the Thai Packaging Centre, the development of detailed test procedures for that equipment and the interpretation of test results.

On a number of days, one-hour talks were given on various aspects of paper and board technology including the manufacture and characteristics of folding cartons and the various ways in which their physical properties are tested. These talks were illustrated by video training films.

Visits were made to the biggest paper mill and a carton manufacturer.

The Consultant left Bangkok on 24 October 1990 for UK and arrived there on 25 October 1990.

III. OBSERVATIONS AND CONCLUSIONS

1. Training of laboratory staff

10 Training sessions of approximately one hour duration were carried out by the Consultant for the laboratory staff. These were supplemented by video training films prepared by the Consultant while on previous missions. Videos shown included demonstrations of how to test:

BURST (PAPER)
BURST (BOARD)
THE PIRA CREASER
THE TABER STIFFNESS TESTER
THE COBB TEST
INK RUB TEST
ELMENDORF TEAR TEST
BEACH PUNCTURE TEST
BENSTEN SMOOTHNESS AND POROSITY TESTER
OIL ABSORPTION TESTER
HEAT SEALING TECHNIQUES

Each session was accompanied by discussion and a question and answer period.

2. Video training films

To illustrate how to make such video training films from the test procedures developed during the visit, material was shot for later editing on:

PAPER AND BOARD CONDITIONING
THE COBB TEST
PIRA RUB TESTER

TAPPI are said to be preparing video training films showing how their tests should be carried out, these should be obtained by TPC if possible.

3. Thai Union Paper Co

A visit was made to see the facilities at the Thai Union Paper Co., for full details, see visit report Annex 3.

This company is obviously very serious about applying technology to its production techniques and they have a very good selection of test equipment housed in several good, fully air-conditioned laboratories. They use mostly TAPPI test methods and expressed a willingness to work closely with the Thai Packaging Centre in developing a range of Thai test methods for paper and board products.

It is important to realize that laboratory test equipment does not give answers to problems, it only provides information about the physical properties of the materials and containers being used by the packaging industry. For the results to have any meaning, they have to be examined by someone who knows how those materials or containers performed under actual use conditions in the converters factory or under end use conditions such as in filling, closing, transportation, storage, on the display shelf, etc. Laboratory people rarely get the opportunity to acquire information about performance. Hence most investigations require a great deal of co-operation between the parties involved, laboratory staff need some understanding of why certain properties are important to converters and packages users and these parties need to appreciate what happens in laboratory testing.

4. Training technical staff from industry

Obviously, the test laboratory cannot invite people in to see how tests are carried out until they have the techniques completely sorted out and written up. Hence the great emphasis on the need for test procedures for all the common tests exactly applicable to the test instrument in use in the Thai Packaging Centre (International test methods cannot be directly applied because they have been written in such a way as to be applicable to many different types of tests instruments.).

It would seem from other visits that the technological level of the Thai Union Paper Co., is far in advance of the carton producing companies who use their products and these companies may well feel overawed by this difference. The very difficult task facing the Thai Packaging Centre is to raise the technological level of the paper and board converting companies; difficult because these small companies are apparently still relying entirely on the craft skills of their machine operators. Efforts to persuade small convertors to acquire test equipment of their own (plus the special skills needed in using the equipment and interpreting the results) can be expected to produce results only very slowly because the benefits are difficult to justify on a cost effective basis. The consultant would recommend two approaches.

5. Problems with industry

Central packaging test laboratories are often criticized on the following grounds:

- Interpretation: The range of specialities (Paper & Board, Plastics, Metals, Glass etc.) is so wide that the level of expertise in the central laboratory often lags behind that available in the industries being assisted. Interpretation and application of test results needs a thorough understanding of the behaviour of materials and packages under actual use conditions, and central laboratory staff rarely get the opportunity to acquire this information. This means that to interpret the test results they are obtaining themselves, centre staff need quite lengthy briefing by technical staff from industry about the characteristics of the problem being experienced.

- Time for testing: When industry has a problem, test results can be needed in hours but a central laboratory can take weeks, even months, to produce the final results.

- Costs involved: Often, companies who use the laboratory feel that they have too little control over how much testing costs. They feel that too large a proportion of the cost goes in briefing, planning, meetings, report preparation and supervision by senior staff.

For more work, central laboratory staff cannot save time by cutting corners, or abort testing that begins to look unpromising and change to alternative approaches, this is quite common in an industrial environment.

- Confidentiality: If a company has problems they may often not want outsiders to know the details. Most companies cannot accept a central institute's assurances of confidential treatment of their results.

- Proposed new approach: To overcome some of the problems described above, it is suggested that selected technical staff be permitted direct access to the testing laboratory facilities under these conditions:

Technical personnel from the companies would first undergo training in the use and applications of each piece of laboratory test equipment before being permitted access to it. If the introductory course was prepackaged using video training techniques, users could begin at any time, work at their own pace and take up little of the time of the Centre's experience staff.

It is envisaged that time on the test equipment would be booked in advance and paid for by means of an hourly charge. The users would sign in and out and the accumulated hours would be charged to the company at the end of each month. An hourly, flat, rate, permitting access to all equipment in the laboratory would be made, different ratings for different equipment would be too complicated to apply.

Each participating company is required to make a regular monthly payment to the Packaging Centre, based on a reasonable estimate of the number of hours that their staff would expect to use the facilities, any additional hours requiring clearance by the company management. This, combined with the fact that the work being carried out can be accounted for precisely by their own people, gives them the control over expenditure on testing that they need.

- Advantages envisaged for this proposed method of working: The advantages of such a scheme can be summed up as follows:

a. Industry could obtain test results in hours, when the urgency justifies it.

b. Technical staff from industry have a chance to understand the exact function of the test equipment in the laboratory and are therefore much more likely to request testing and development work from the Centre. They are also better able to introduce technological improvements into their own companies.

Technical staff from industry will be making regular visits to the Packaging Centre and these regular contacts with the Centre staff will do much to increase the chances of them working together and sharing their expertise.

c. The limitations imposed by the small number of technical staff employed by the Centre are reduced and loss of experienced staff would not have the disastrous effect on the service to industry that it can have at present.

d. The Centre's technical staff are freed from much routine testing work (especially that associated with quality control) enabling them to concentrate on the other services such as: trouble shooting, planning test programmes, information, training courses and seminars, applied research projects, improving their own knowledge of new developments, acting as consultants to industry, giving technical support to Standards Committees and committees concerned with development of the industry, etc.

The Centre staff will continue to provide a testing service for those companies who are not able to utilize their own technical staff in the way suggested.

e. The cost of testing work is cut dramatically permitting the build-up of those background correlations so important for interpretation.

f. Companies are in a position to introduce raw material assessment and quality control testing at reasonable cost.

g. The Packaging Centre has a way of building up a regular contribution to its costs. More and more Governments are making this a requirement for their continued support.

h. New types of test equipment, or replacement of outdated existing models can be more easily justified, if it helps to pay for itself by allowing others to share in its use.

- Conclusion: There will obviously be problems associated with inviting technical personnel from industry to plan, supervise or actually carry out testing activities in the Packaging Centre. It has been heartening to discover during past discussions of this proposal that most of the difficulties envisaged are those associated with the time available on the test equipment. Yet most test equipment is greatly underused at present and problems associated with equipment being in frequent use should be welcomed as evidence that a real impact was being made on the objective of raising the technological level of the local packaging industry.

This is a relatively new concept when applied to materials testing, but companies sharing time on extremely expensive computers and hiring expensive equipment of other kinds is nothing new. If properly handled, this method of working could bring great advantages to the centre and industry. The greatest problem of all faced by a National Packaging Centre is that of being ignored by local industry who are supposed to be benefiting from the centre's existence.

IV. RECOMMENDATIONS

1. Test procedures

That the system of preparing detailed test procedures for the instruments in the laboratory be continued until all the common methods of test have been completed.

2. International standard test methods

The test methods used as source material for the test procedures should be primarily ISO & TAPPI.

3. Thai standard test methods

The Packaging Centre test procedures will become the basis for standardized test methods to be used throughout Thailand, therefore it is important that the co-operation of the paper & board industry is a constant factor during this process.

4. Paper testing

The Thai Packaging Centre should work closely together with the Thai Union Paper Co. in developing laboratory test procedures for all pieces of test equipment that they have in common.

5. Practice with test procedures

More paper and board packaging samples from local companies should be obtained and tested as practice to develop the testing competence and speed of the laboratory staff. Results from the different members should be compared to build confidence in test result reproduction.

6. Test results background data

The results from any practice or actual tests carried out should be recorded in separate bench books for periodic analysis to build knowledge of what constitutes "normal" results for the materials and containers at present in common use in Thailand.

7. Video training films

When the Laboratory Head is confident that they are fully competent and practiced in a given test procedure, a video film of that procedure should be prepared for use in training future members of the Paper & Board laboratory and technical staff in industry.

8. Technical staff from industry

Selected technical personnel from industry should be permitted to direct testing schedules in the centre's laboratories.

9. Staff training

That the staff embark on a training programme based on the British Packaging Institute correspondence course. If possible technical staff from industry should be included both as participants and as speakers in their own specialized subjects.

Principle Contacts made

1. UNDP
G.P.O. Box 618
Bangkok 10501
Thailand
Mr Nils Ramm-Ericsen UNIDO
Mr R Kortas UNIDO
K. Amara P. Admin.

2. Thailand Institute for Scientific and Technological Research
Thai Packaging Centre
196 Phahonyothin Rd
Chatuchak
Bangkok 10900
Thailand
Dr Santhad Rojanasoonthon Governor
Dr Amornrat Swatditat Director

3. UNOM Packaging & Printing
1539/5 Soi Udomsuk
Chan Rd Yannawa
Bangkok 10120
Mr Montri Itti-Amorn Gen. Manager

4. THAI UNION PAPER Co. Ltd.
131 Poochaosamingprai Rd
Prapradaeng
Samutprakarn 10130
Thailand
Mr Jate Dharmvanich Manager
Mr Phornchai Iamsirigullmitr
Head of Production



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

PROJECT IN THAILAND

14 March 1990

JOB DESCRIPTION

DP/THA/87/019/11-02/J-13320

Post title Expert in Paper and Board Consumer Packages

Duration Two months

Date required July - August 1990

Duty station Bangkok (Thailand), with possible travel within the country

Purpose of project

The purpose of the project in connection with the expert mission is to strengthen the capability of TPC staff on the planning and implementation of applied research and development programmes relevant to the needs of the Thai exporting community, as well as on interpretation of related laboratory testing results and subsequent elaboration of advice to the concerned parties. In connection with this mission, some prototypes of export packages for specific target products and markets are expected to be produced.

Duties: The expert will be assigned to TPC where he will work in consultation with the National Project Director (NPD) and in close co-operation with the local technical counterparts designated for the mission. He will be specifically expected to:

1. Get acquainted with the Thai Packaging Centre (TPC) in terms of operational structure and installed testing equipment and human resources for research, development and quality control on paper based packages cartons as well as respective materials;
2. Co-operate with the NPD in the selection of two or three export products distributed within the three categories of horticultural, processed marine and health products, for study of respective retail packages particularly suited to the specific conditions of their main importing markets:

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

Project Personnel Recruitment Branch, Department of Industrial Operations
UNIDO, Vienna International Centre, P.O. Box 300, A-1400, Vienna, Austria

3. Provide information on the main types of retail paper and carton based packages used for the above selected products at the target importing markets as well as buying habits and purchasing power of the envisaged consumers - information details will be looked for in co-operation with the counterparts if not known to the expert with regard to some of the target markets;
4. Search and gather information on locally available (either imported or locally manufactured) paper and carton materials, machinery and techniques for production of retail packages of the main types identified in the competitive target markets; select a folding carton for further exhaustive applied research and development;
5. Elaborate a few alternative models of the proposed folding carton (and write out complete specifications and tolerances for them); execute and train the counterparts on a programme of laboratory tests on the concerned packaging materials, tentative prototypes and even packaging contents whenever appropriate for appraisal and improvement of the models being studied - using as much as possible of TPC testing resources and outside complementary testing whenever required or convenient;
6. Analyse the production costs of the technically suitable alternative models, for final discussion and appraisal at joint meeting with TPC, exporters, package and packaging materials manufacturers - together with related graphic design models if already available from the packaging graphic designer who will also be assigned to the project;
7. Co-operate with the NPD and technical counterparts in programming of further works with regard to the remaining important export products which were selected according to section 2. The expert will also be expected to prepare a final report, setting out the findings of his mission and his recommendations to the Government on further action which might be taken.

Qualifications: Packaging technologist with a university degree or equivalent experience and specific specialization in structural design, specification and laboratory testing of paper and board consumer packages for applied research and quality control purposes.

Language: English

Visit to The THAI UNION PAPER Co.

Company: THAI UNION PAPER CO. Ltd.
131 Poochaosamingorai Rd
Prapradaeng
Samutprakarn 10130

Date: 8 October 1990

Persons seen: Jate Dharmvanich Manager. Manufacturing Div.
Phornchai Iamsirigullmitr Head Production & Promotion

Visited by : John Salisbury UNIDO Consultant
Dr A. Swattitat. Head Thai Packaging Centre
6 members of staff, Thai Packaging Centre

Purpose: To examine the range of boards available to the Thai
carton making industry and see the technical facilities
at the mill.

Part of large Group. Siam Cement. The group has several paper mills and
a corrugated box factory.

At present, this mill supplies 15% of the paper & board used in Thailand
but with the introduction of a new machine planned for 1991, expects to
increase this to 40%

Up to 10% of output is exported, usually to Malaysia & Singapore

Products are well prepared for dispatch, wrapped in paper. then the
pallet load is polythene wrapped.

20% of the pulp used is imported. the rest is local.

Few Converters are in a position to specify their needs. Mill technical
staff provide technical backup to Converters.

Test methods used are almost entirely TAPPI. said to be used by most of
the Thai industry

Paper is made on a Fourdrinier machine

A range of duplex boards is produced on a cylinder machine with 3 stations. On-machine and off-Machine coating can be carried out.

Main laboratory well conditioned at 27 C & 65 % RH

There are two laboratories. The test equipment modern and of excellent quality and includes:

Universal and Horizontal Tensile tester - L & W Alwetron
Elmendorf tear tester L & W
Burst (paper only) Perkins USA
Stiffness L & W Electronic (completely compatible with the TABER
Bench Micrometer TMI 49-70
Glossmeter Teledyne 480A with print out facility
Porosity - Gurley
Roughness, Porosity & Compressibility - Bendsten Model 6
Brightness & Opacity - Photovolt - Model 670
Folding Endurance - TMI
Ply bonding - Kunagi - Japan
Paper expansion - PIRA
Light Box - Local
Densitometer - Macbeth
Moisture content - Satorius autobalance
Ink drying time IGT
Proofing press (small printer)
Sample cutting - Punch & Die

Comments. The company are serious about the application of technology to their products, and well equipped to do so.

TPC MATERIALS LABORATORY PROCEDURE

SUBJECT: BOARD AND CREASE STIFFNESS TESTING

No: 20 ISSUE No: 1 FILE NAME: PRCREASE.TPC DATE: 13.09.90

BASED ON STANDARD TEST METHODS: INSTRUCTION MANUAL. Note 8

PREPARATION OF THE TEST PIECES

1. Condition the samples overnight according to TPC Proc. No 2.

2. Identification of the grain direction . Cut a square of board (approx 50 mm side) and flex it between the fingers in both directions. The board will feel stiffer when the MD (machine direction) runs from hand to hand. Mark the MD on the sample Note 1.

3. TEST PIECES FOR BOARD STIFFNESS. The required test piece size is 70 mm x 38 mm, the board direction being tested is the one running along the 70 mm length. See Diagram 1.

Mark off on your sample where the creased and uncreased CD & MD test pieces can best be taken from then cut the carton with a knife or scissors along the short edge of the test pieces so as to make it easier to insert in the special test piece cutter. Note 4

Mark each test piece as either MD or CD, at this stage and in the case of the test pieces with creases on them, put the mark close to the crease so that it is not lost when trimming.

Place the sample under the special cutter provided, the edge of the board must be against the stops at the hinge end of the cutter aperture. Press down.

Cut 10 test pieces for both MD & CD:

4. TEST PIECES FOR CREASE STIFFNESS TESTING. See diagram 2 which illustrates MD & CD test pieces with creases across them. Note 2

The same special cutter is used but more operations are involved.

Firstly cut the test piece as for board stiffness, but with the crease running across the test piece approximately central and parallel to the cutter stops. See diagram 3.

Place the test piece in the cutter again, positioning it so that the crease is placed along the mark parallel to the cutter edge (use the left hand edge of the crease for alignment, see diagram 4A). The right hand edge of the test piece is now trimmed away (take care with your fingers).

The test piece is then turned round (as in diagram 4B) lining up the previously trimmed edge with the LH edge of the side plate. Trim off the other edge.

The test piece is now ready.

Take 5 test pieces for each crease being tested. Note 4.

INSTRUMENT CHECKS

1. Use the PIRA CREASE & BOARD STIFFNESS TESTER, supplied by H.E. Messmer, UK. See line drawing attached.
2. Plug in and switch on (at A) the instrument. The light B should be on. The digital display (C) will probably indicate some random number; this should be cleared by pressing the ZERO-CHECK button (K). Allow 30 minutes warm - up before using.
3. Zero the instrument by holding down the ZERO-CHECK button (K) and turning the SET ZERO knob (E) until the indicator reads zero. Release the ZERO-CHECK button. This is the only adjustment needed in normal use.
4. Checking of the calibration is only needed every 12 months. see Manual for details.
5. At no time during use should the force on the load bar exceed 400 g

PROCEDURE

A. BOARD STIFFNESS

1. Swivel the LH clamp into the start position.
2. Fix the test piece in the clamp (J) so that it is just touching the load bar, but not pressing on it. If necessary, loosen the curl adjustment knob and turn the clamp until the test piece just touches the load bar. Lock the curl adjustment knob. Note 5.
3. Measure the board stiffness by rotation of the LH clamp anticlockwise through 15 deg against its stop. Take the reading when the timer light goes out after 15 secs.
4. Note the reading on the display in the DATABOOK Results Sheet. Note 6.
5. Return the left hand (LH) clamp to the start position and remove the spent test piece (make sure that it is not used again in a later determination). Press the zero check button and zero the instrument.
6. Repeat the test for the remaining pieces, 5 with one board face towards the bar and 5 with the opposite board face towards the bar.

B. CREASE STIFFNESS

1. Swivel the RH clamp into the start position.
2. Open the jaws of the clamp by turning the fish-tail knob a quarter of a turn either way and insert the larger panel of your test piece with the role of the crease facing outward. Seat the test piece well into the base and back of the clamp, then close the jaws by turning the fish tail knob into the vertical position.
3. Rotate the clamp clockwise through 90 deg against it's stop.
Note 7
4. Take the reading when the timer light goes out (15 secs) and write it in the DATABOOK results sheet
5. Return the clamp to the start position and press the ZERO CHECK button.
6. Repeat the test for the remaining test pieces.

EXPRESSION OF RESULTS

1. Calculate the mean values for the displayed board stiffness for each face and take the mean. Do this for both the machine and the cross grain directions.
2. Calculate the mean value for the crease stiffness results for each grain direction.
3. The critical factor is the ratio of crease stiffness/board stiffness, both measurements being made in the same grain direction of the board.

When calculating this ratio, divide the crease stiffness (in g.cm) by the board stiffness (in grammes) taking the values as shown directly on the display. Notes 9 & 10

TEST REPORT

The test report shall include:

- a. Reference to TPC Procedure No: 20 Issue 1
- b. Full identification of the material tested, in particular origin, grammage, thickness, any special test requirements
- c. The test temperature and humidity:
- d. The arithmetic mean (average) for board stiffness (in g.) for both the MD & the CD.
- e. The arithmetic mean for crease stiffness (in g.cm.) for both the MD & the CD.
- f. The ratio of the above two results for the MD & the CD.
- g. Comment on the appearance of the roll of the crease.
- h. Any details of procedure that are optional, or not included in this procedure, together with any other information that may have a bearing on the results.

NOTES

1. **GRAIN DIRECTION.** Board is manufactured in a continuous strip and the direction in which it moves through the board making machine is called the Machine Direction (MD) of the board. Board is always stiffer in the MD than the direction perpendicular to it which is called the Cross Direction (CD).

The PIRA Stiffness Tester is used to measure the force required to bend creased and uncreased board in the machine direction (MD) and the cross direction (CD).

2. **NAMING THE DIRECTIONS WHEN CREASE STIFFNESS TESTING.** The MD crease is the one running across a MD test piece as used for board stiffness testing and the CD crease is the one running across the CD test piece. The reason for this is that the board stiffness uncreased is to be compared with the board stiffness after creasing.

It helps when deciding where to cut the testpieces for crease testing from a given carton, to take an already cut and trimmed, creased, test piece, and to place this on the carton so as to decide where to place guillotine cuts so as to allow easy access to the special test piece cutter. If this is not done, you may not get enough samples from the cartons available.

3. **SAMPLE SELECTION** Take care not to bend the crease when preparing the test pieces.

4. WHERE TO MARK OFF TEST PIECES and DIE STATIONS. With the board stiffness test pieces there is no problem. However, which creases are chosen for measurement does matter and depends on knowing which ones are likely to cause problems. In general, these will be the ones on flaps that have to be bent and tucked into slots at speed, the factory Production personnel will know which these are. If no creases have been specified as critical, either take a selection or pick out which appear to be the best and the worst from their appearance and do those separately.

Each die station on the cutting and creasing machine in the factory is creating cartons with different crease characteristics. In some cases, each die station will have to be tested.

5. BEND ANGLE

BOARD STIFFNESS is measured by bending the board through 15 degrees.

Not all test pieces are flat and any bend already existing in the test piece must be compensated for by adjustment of the position of the clamp before testing begins. This is done by loosening the knurled knob, moving the clamp until the test piece just touches the bar, then tightening the knob.

The force value displayed by the instrument is taken after 15 secs (when the timer light does out) and is in grammes. The test conditions are fixed as the same for most stiffness testers, that is the test piece is 38 mm across and the force is applied 5 cm from the clamped end.

If the result is required in mN.m, multiply the grammes reading by 0.4905.

Because board surfaces have different properties, 5 samples are tested with one surface of the board in contact with the bar, then 5 with the other surface in contact.

CREASE STIFFNESS is measured by bending the crease through 90 deg.; the force experienced after 15 secs has elapsed is held on the display.

The display for crease stiffness reads in g.cm. The force is in grams and the distance from the crease to the bar is 1 cm.

If the results are required in mN.m the g.cm reading is multiplied by 0.0981

6. INTERNAL TIMER The internal timer starts automatically and after 15 secs. the crease stiffness value will be displayed.

Should you wish to read the crease or board stiffness reading after the 15 second period, depress the ZERO CHECK button.

7. STANDARDS. BS 3748 : 1964 is applicable to the board stiffness part. No standards are known for crease stiffness testing)

8. APPEARANCE OF CREASES. The quality of a crease can initially be assessed by its appearance. Cracking of the liner or back of the board are obvious defects. An irregular, crumpled appearance of the rib on the inside of the folded flap can also indicate a potentially unsatisfactory crease in carton erection and closure.

9. DESIRABLE RATIOS. Studies of packing line performance have shown that successful carton performance can be anticipated when the ratio of crease stiffness/board stiffness falls within the following ranges:

Machine Direction 1.5 to 3

Cross Direction 3 to 7

This is a general guide that can be modified as specific results are accumulated. The results were obtained under test conditions of 23°C and 50% RH, if these conditions are not used then the desirable ratios will be different, eg in higher humidities the ratios will be lower. If creases are too stiff, the made up carton can be distorted and the force made even pull newly glued joints apart.

PIRA CREASE STIFFNESS RESULTS SHEET

DATE: TESTED BY: TPC Proc. No: 20

TEMP.: %RH:

SAMPLE IDENTIFICATION No & MATERIAL TYPE:

A. BOARD STIFFNESS RESULTS (g)

MD, FACE IN	MD, FACE OUT	CD, FACE IN	CD, FACE OUT
1.....	1.....	1.....	1.....
2.....	2.....	2.....	2.....
3.....	3.....	3.....	3.....
4.....	4.....	4.....	4.....
5.....	5.....	5.....	5.....
Mean:	Mean:	Mean:	Mean:
Mean:		Mean:	

B. CREASE STIFFNESS RESULTS

MD	CD
1.....	1.....
2.....	2.....
3.....	3.....
4.....	4.....
5.....	5.....
<hr/> Mean:	<hr/> Mean:

CREASE STIFFNESS/BOARD STIFFNESS IN MACHINE DIRECTION:

CREASE STIFFNESS/BOARD STIFFNESS IN CROSS DIRECTION:

NATIONAL, REGIONAL AND INTERNATIONAL TEST METHODS

A talk given by UNIDO Consultant John Salisbury

When considering setting up a materials testing laboratory, one of the first things to decide is which of the many kinds of test methods available will be used. This is because the equipment specifications in those test methods can differ quite considerably and you don't want to buy your test equipment and then find that it does not comply with the methods you, or your country, have decided to adopt. Always remember when ordering test equipment to state on the order form the test methods you have decided to follow and wherever possible, include the requirements given in those methods.

Today we are going to talk about the various kinds of test methods available and suggest how they can be used.

In the early days of materials testing, the method of use for a given piece of test equipment was described by the inventor. He or she would probably be working in a research institute, or the R & D Dept. of a large company, and when they were satisfied that they had a good instrument, they would usually approach a test equipment manufacturer to make copies of their new test instrument for sale. They would prepare a 'HANDBOOK' which described how to use the instrument. That is still the case today and the instrument handbook is often a useful guide, but not always.

After a while there would be a number of instruments on the market using different ways of measuring a given property. This led to confusion between suppliers and users when trying to agree how a property should be measured so that their test results could be compared. It was necessary to come to an agreement, at least within a given country, on a standardised way of testing.

This agreement could be brought about by a National Standards Organisation, such as the British BS, or the German DIN or the Japanese Standards Institute and such standard test methods are in use in those countries and in the countries over which they had influence. However, because so many interests were involved, this method of reaching agreement on a standard method was rather slow (some could take 10 years before being finalised), and the industries involved often could not wait for the process to finish.

Therefore, standardisation of test methods was also achieved by

Associations formed by industry themselves, such as the Glass Makers Federation in UK, or the Plastic bottle Manufacturers Institute in USA, etc., and they did not always agree with the National Test Methods (but these differences could usually be resolved with time and discussion). These trade organisations had first class research laboratories, such as TAPPI in the USA, PIRA in UK and there were many government and semi-government laboratories making important contributions to the development and standardisation of testing techniques, such as the American Society for Testing and Materials (ASTM) in USA and the technological centre called TNO in Holland.

As world trade expanded, so differences between the test methods in use in different countries became an embarrassment and agreement between countries was needed as to which was the best test method to use for measuring properties like smoothness, absorbency, porosity, tensile strength, etc.. Regional organisations began to be formed, such as FEFCO which represented the Corrugated Box box industry in Europe, and they issued their own test methods. Regional Standards organisations were formed, such as the SCAN organisation for all the Scandanavian countries. There is one for the whole of Latin America, for example, formed to ease the burden on the individual countries which could not afford the time and money needed in creating their own standards, apart from the fact that regional standards had many advantages over purely national ones.

In countries which only became industrialised in recent years, it is not suprising that many different test methods came into use, because many different countries were involved in the industrialisation process, France, Germany, Japan, USA, UK, the Scandanavian countries, etc., each tending to introduce test methods from their own country or their own region.

So how do we choose from the wide array of test methods described above ?, especially when the National Standards Organisation in a newly industrialised country is selecting one on which to base it's own National standard for a given application. This problem was solved by the formation of THE INTERNATIONAL STANDARDS ORGANISATION (ISO), a United Nations Organisation.

ISO brought together representatives from the worlds industrialised countries with the aim of comparing the many different standards in existance and agreeing on one in each case, suitable for use throughout the world. This is a huge task and it is by no means complete but many ISO TEST METHODS for use in the testing of packaging materials are already available and there seems little doubt that these are the ones that should be adopted at country and company level.

If a company or country works with the test methods developed by a

country in another part of the world (eg SCAN, TAPPI, BS, DIN, AFNOR, etc) they risk offending the national sensitivities of other countries. Comparison of their results with other companies and organisations within their own country is often very difficult when different test methods have been used. In Indonesia, few standard test methods relevant to packaging have so far been issued; it would seem very desirable to base those that will be issued in the future on an existing ISO method and the same applies to companies or organisations intending to set up testing facilities. A full set of ISO standards is available from the local Standards Organisation at very reasonable cost.

A good example of this need for international standardisation of test methods is the requirements that have to be met when shipping dangerous goods around the world. Obviously, if shipping lines, airlines, railway companies warehousing companies, etc., are to be satisfied that any dangerous goods that they are handling are satisfactorily packaged, the rules that govern the design and testing of these packages have to be agreed by all the countries concerned. This has been done by issuing the standards through a special organisation operating under the auspices of the United Nations Organisation.

The information in an ISO standard test method is usually grouped under the following headings:

SCOPE AND FIELD OF APPLICATION

REFERENCES (to relevant standards)

DEFINITIONS (the principle terms used in the standard are defined)

PRINCIPLE (of the method being described in the standard)

APPARATUS (specifies the requirements that the test equipment used must meet which is very important when ordering the test instrument)

TEST SPECIMENS (specifies the size, shape, condition, handling etc., of the test pieces)

CONDITIONING (specifies the time, temperature and humidity under which the test material is to be prepared)

PROCEDURE (describes how the test should be carried out under various conditions)

EXPRESSION OF RESULTS (how to calculate and present your results)

TEST REPORT (all the items that should be covered in a good test report.)

So does this mean that Standard Test Methods from other countries should be ignored ?, not at all. There are at least two occasions when knowing them can be very helpful.

When exporting to a given country, it would be very helpful to know the relevant standards of that country, or at least to have access to them (perhaps through one of the National organisations), in case the importing country insists on their National Standard Test Method being applied despite the existence of an ISO standard.

The second occasion is when one comes to apply the ISO standard test method to your particular test instrument in your laboratory and you need detailed instructions to guide your staff. ISO standards are not suitable for direct application to a given test instrument as a guide document for laboratory technicians. Because ISO methods have to apply to many different makes of test equipment it cannot be detailed enough. It is therefore advisable to produce for each test instrument you have, a working document that we in BBIK call a TEST PROCEDURE.

A TEST PROCEDURE describes exactly how a given test should be carried out in a given laboratory, using the specified piece of test equipment. An example of such a document is attached. You can see that it not only describes what the technician needs to do, but also has a series of notes that explains why certain decisions have been made so that help the operator learn to understand what is being done. An important advantage is that it will be in the Indonesian language.

The person preparing a TEST PROCEDURE for a given instrument will, of course read the manual that came with the instrument and (where possible) base the procedure on the appropriate ISO test method. As National and Regional test methods for testing the same property often explain the various points differently, it is most helpful when seeking a thorough understanding of the the techniques involved to read as many as possible of the test methods from ASTM, TAPPI, SCAN FEFCO etc. Again, copies of some of these are available from the local Standards Institute.

A good TEST PROCEDURE should be modified as new factors emerge when using it, for example, I discovered the hard way that if one of our new instruments was left with it's switch in the ON position, it started up incorrectly when plugged in to the mains supply next time and damaged itself. Obviously, the need to guard against this must be stressed in the instructions for use (ie. THE TEST PROCEDURE). Another point was that the weights used on the BEACH PUNCTURE TESTER jammed on if screwed up too tightly, a note has been added to the TEST PROCEDURE so as to avoid this in the future. Preparing your TEST PROCEDURES on a computer makes such modifications very simple, of cour. e.

When you have a new instrument, it is vital to practice the TEST

PROCEDURE many times before. To ensure that the results are well recorded so that over a reasonably short period of time, many examples of typical results are accumulated, it is suggested that a DATABOOK be allocated to each piece of equipment.

To sum up, use the local National Test Methods whenever possible (hopefully, they will be based on existing ISO standards). When these are not available use ISO test methods and if these are not available, use Regional rather than other National alternatives or those from specialised organisations, such as TAPPI. But read as many standard test methods as you can to increase your understanding of the testing techniques involved, then prepare a TEST PROCEDURE that describes in detail how the test is to be carried out on your equipment.

Backstopping Officer's Comments

The consultant took advantage of his great experience in assisting the establishment and strengthening of packaging technology institutions in developing countries, to give specific advice on ways and means of co-operation between institutions and the related industries.

This co-operation may become extremely useful for both the institution and the industries, to the extent that on the one hand the institution develops a wider programme of applied activities, on the other hand the industries receive an appropriate support, mainly in terms of technology and quality control.

At long term this co-operation will be instrumental for the actual technological development of the countries concerned within the field of packaging, in the same way that it would apply to several other technological fields.

The main activity of the consultant consisted of the elaboration of test procedures for the instruments which are available at the Thai Packaging Centre, within the specialized field of the mission: paper and board packaging materials and packages testing.

Particular attention was given by the consultant to training of his mission counterparts in the selection of testing methodologies and writing out of related test procedures.

The use of video recorded procedures was recommended for the future training of technicians from the Thai Packaging Centre and from the industries, in the operation of the testing equipment and in the test procedures.

UNIDO supports the recommendations of the expert in their generality and particularly emphasizes the importance of increasing the contact and active co-operation between the Thai Packaging Centre and the national packaging manufacturer and user industries.