Packaging Technology Centre (PTC)

In Context

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Packaging Technologist working with compression tester at the

TBS Transport packaging Laboratory

0. Overview

Packaging is a field that is wide and fast changing. It is a function related to other functions like marketing. In fact, it is a link between production, distribution and marketing.

The packaging of a product should be an integrated part of the manufacturing process, and generally forms the last stage in this process.

While some goods are thus made more attractive so as to improve saleability, the principal reason for packaging is to protect products from external actions and influences (such as mechanical loading, dust, humidity and solar radiation).

It is an art, science and technology of preparing goods for transport and sales. Packaging exists in many forms; it can be a card board, corrugated box, metal, plastic or paper wrapper.

In a view of this diversity, packaging technology is gaining prominence rapidly with inter-linkages with engineering, process and transport industries.

A modern package is expected not only to contain but also to preserve and dispense a product. All goods require good packaging to protect them during transport and distribution to the end users. It is the packaging of a product that ensures a product can be stored and stocked, that it is protected against corrosion or spoiled, and that enables modern systems of transport, distribution and warehousing to be applied.

If packaging is to fulfil its protective function, the packaging material has to be sufficiently resistant to the influences that the packed product is to be protected against.

Use of modern transport systems, such as containers, requires that particular packaging dimensions be observed according to a system of modular co-ordination. A package must communicate with and motivate its existing and potential market**. "A good package contains what it sells and sells what it contains**". Consequently, such a package has often been referred to as a silent salesman. Needless to say that good packaging is **sine qua non (**Something that is essential before you can achieve something else) for success in exports

In the view of the above the Government of Tanzania through TBS established the packaging centre as part of its efforts to support a coordinated development of the packaging industry by strengthening the existing standardization and testing capability in the area of packaging.

1. THE PACKAGING TECHNOLOGY CENTRE (PTC)

Packaging Technology Centre was established in 1989 and became operational in July 2008. The government has established this centre being part of its efforts to support a coordinated development of the packaging industry by strengthening the existing standardization and testing capability in the area of packaging

Considering that achievement of satisfactory quality and packaging is an essential element in any plan for co-ordinated production development and exports from Tanzania. Therefore, it has been proposed that a centre for packaging technology should be set up within TBS to help in the orderly development of packaging technology within the country.

PTC, which operates under the Tanzania Bureau of Standards, is aimed to become the premier destination for all industries in need of packaging technology

The packaging services provided by the TBS/Packaging Technology Centre include:

i) Testing packages and packaging materials to ensure quality.

ii) Providing training to the industries and Small and Medium Enterprises (SMEs) on matters concerning quality packaging design, structural and graphical.

iii) Conducting research and consultancy works on the issue pertaining to quality packaging

iv) Providing third party certification for packaging material and packages produced according to acceptable standards.

v) Providing testing services for packages and packaging materials.

vi) Developing national standards on packages and packaging materials.

vii) Control facilitations of import and export of the packaging materials against the relevant standards

viii) Providing information on packaging standards, requirements and technology

2. PTC TEST LABORATORIES

The PTC-Packaging test laboratories conduct pre-shipment performance testing and often other kinds of package, material and product evaluations. Essentially, every test stems from the need to make some sort of decision. Test results provide decision-maker with information to help maximize correct decisions. Therefore, the appropriateness of the tests and the accuracy of the data is of paramount importance. It is better to have no information at all, than to have flawed or incorrect data.

The PTC-House covers the following packaging test Laboratories:

- Transport packaging laboratory
- Food packaging laboratory
- Climate chamber

2.1 Transport packaging laboratory

The real world of transportation and distribution is large and complex, with both huge scale and a multitude of variables. Many times in business we want to be able to predict or anticipate the future outcome of a decision.

For example, we may be considering changing protective packaging design for an existing product and want to know how it will perform under actual shipping conditions.

To perform this evaluation in the complex real world would be difficult and expensive. Instead, a series of laboratory tests have been designed and performed and evaluate the results.

In packaging laboratories we often do pre-shipment performance testing, where we subject a sample product and package to a series of tests. We evaluate the protective ability of the packaging in terms of the susceptibility of the product to damage and the intensity and type of hazards in the transport environment.

The tests are done with actual products unless that is dangerous or an acceptable dummy product is available. The dummy product if used needs to be able to represent the damage potential of the actual product.

Transport packaging testing equipment are used to conduct simulation tests which attempts to link laboratory tests to actual measured shipment and distribution hazards. Instruments measure actual field conditions such as vehicle vibration, package drops, or compressive loads etc; and used as guide information during testing. Transport packaging testing facilities include the following machines:

- Compression test machine
- Vibration test machine
- Shock test machine
- Drop test machine
- Inclined impact machine
- Climate chamber

2.1.1 Compression tester:

This machine is used for measuring the ability of the container to resist external compressive loads applied to its faces, edges or corners. The tester covers compression on shipping containers (e.g. boxes and drums) with products. The tester also applies for multiple containers or unit loads.

Compressive resistance is one of the properties used to evaluate the ability of shipping containers, components, and unit loads to successfully survive the compressive forces they are subjected to during storage and distribution

Fig. 1-Touch test Compression machine

Fig.2-Touch test Vibration machine

2.1.2 Touch test vibration

The Touch test vibration machine is used for testing filled shipping containers against vibrations. The touch test vibration is used to assess the performance of a container, with its interior packing and means of closure, both in terms of its strength and the protection that it provides to the contents when it is subjected to vibration such as it experiences in transportation.

2.1.3 Shock tester:

Fig-3. Shock test machine

Shock testing replicate the effects of vertical drops of loaded shipping containers, cylindrical containers, and bags and sacks.

Shipping containers and the interior packaging materials are used to protect their contents from the hazards encountered in handling, transportation and storage.

Shock is one of the more troublesome of these hazards. Controlled shock input by shock machine provides a convenient method for evaluating the ability of shipping containers, interior packing material, and contents to withstand shocks.

2.1.4 Drop tester:

Fig-4. ***Packaging Technologist working with drop tester at the transport packaging laboratory***

This testing machine covers for the drop testing of loaded boxes, cylindrical containers, bags and sacks by the free-fall method. This test method is particularly suitable for containers that are normally handled manually during some part of their distribution cycle. Containers of such bulk or mass that cannot be handled manually may be tested more satisfactorily in horizontal/inclined impact testers.

This test method is intended for use in evaluating the capability of a container to withstand the sudden shock resulting from a free fall, or to evaluate the capability of a container and its inner packing to protect its contents during the sudden shock resulting from a free fall. The test may also be used to compare the performance of different package design. It also permits observation of the progressive failure of a container and the damage to its contents.

2.1.5 Inclined Impact tester

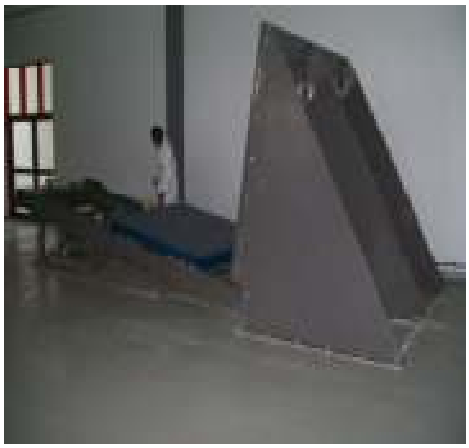


Fig-5 a). Inclined impact tester

Fig-5 b) Packaging technician working with Inclined Impact at the PTC-Packaging laboratory

This testing machine covers two aims for conducting impact tests on loaded containers or shipping units (pallet loads). First, to test the ability of a container or shipping unit to withstand impacts, and second, to test the ability of a container or shipping unit or interior packing or both to provide protection to the contents when subjected to impacts.

2.2 Food packaging laboratory

- Head space measurement
- Oxygen analyzer
- Leakage tester
- Migration testing facilities
- Portable Spectroradiometer

2.2.1 Head space analyzer

Fig-6. PBI Dansensor (CheckMate II)

PBI is the head space analyzer which analyzes the head space gases (CO_2 and O_2) in a food packed product. It assists in evaluation of package-gas permeability as to whether or not there is a possibility for gas transfer from outside to the packaged food which affects preservatives ratios.

The CheckMate is designed for use with all types of modified atmosphere packages and has a sensitive O_2 and optional CO2 sensors.

2.2.2 Oxygen analyzer

Fig- a) 7. Oxysense 4000B oxygen analyzer

Fig-7 b) Food packaging technologist working with Oxysensor at the food packaging laboratory

The Oxysense 4000B oxygen analyzer is a portable, fully integrated instrument that enables the non-destructive measurement of oxygen in sealed packages or bottles. The portability of this system makes it perfect for multiple-location testing programs.

2.2.2.1 Applications

All the food packaging testing equipment mentioned above have a wide range of application in different contexts:

2.2.2.1.1 Packaging

- Oxygen measurement in packages and bottles.
- Packaging materials evaluation and comparative testing
- Package design evaluations.
- Permeability testing of closures containers and films.
- Research and development.

2.2.2.1.2 Food and beverage

- Quality assurance and quality control.
- Oxygen scavenging performance.
- Modified atmosphere packaging (MAP) and bottling line startup.

2.2.2.1.3 Pharmaceutical

- MAP package evaluation and control.
- Dissolved oxygen monitoring.
- Blister pack testing
- Oxygen detection in anaerobic environments.

2.2.2.1.4 Bio-medical

- Animal tissue studies.
- Oxygen detection in anaerobic environments.

2.2.3 Leakage tester

Fig-8. Air proof leakage tester

Leak tester is designed and applicable in airproof test of foodstuff, pharmaceuticals, chemical and other industries. Users can efficiently compare and estimate the airproof property and seal technique of flexible packages by test. It can offer scientific data of what is useful in estimating whether the relative technical requirement is suitable. And it can also do airproof test of packages having done falling and press tests**.** In principle

the test is such that; Inner-out pressure difference of the specimen immersed in the water, which formed by vacuumizing the test chamber, will cause the gas in the specimen to leak. This determines the sealing properties by observing the gas leakage.

2.2.4 Migration testing

Fig-9. Migration testing cells

Migration is the release of package compounds (such as polymer additives and residues) and their uptake by the packaged product. The package materials can be made of metals, glass, ceramics, plastics, rubber and paper. All the package materials can release minute amounts of their chemical constituents when they touch certain types of foods. This transfer, from the packaging to the food, is called chemical migration.

Basically categorized into two groups:

- Global (overall) migration
- Specific migration

2.2.4.1 Global migration

Global (overall) migration is the total amount of migrants transferred from a package sample to a food irrespective of composition, that is milligram per unit of contacting area between food and plastic (or milligram per sample kilogram).

2.2.4.2 Specific migration

Specific migration is the amount of a specific migrant transferred from packaging to food. Interest in specific migration focuses on those substances that are potentially toxic to human beings and, hence, specific migration is only controlled when these substances may be present.

2.2.5 Portable Spectroradiometer

Fig-10. StellarNet EPP2000C UV-VIS Spectrometer

Stellar Net EPP2000C spectrometer is a miniature fibre optic instrument used for UV and VIS measurements, or detection of penetration of light radiations intensity into package materials. It is a portable spectrometer with software that can be used for remote sensing and process applications in the factory or field.

2.3 Climate Chamber

Atmospheric temperature, moisture content and pressure all affect protective packaging in various ways. Plastics may soften or become brittle with temperature changes. Paper is hygroscopic (takes up and gives off moisture to the surrounding atmosphere) and its strength changes with moisture content. For example, typical corrugated box compression strength, as measured in a laboratory on a compression tester, may be reduced by one-half or more under very humid conditions. Atmospheric pressure affect packages containing air (bubbles etc), and packages that encapsulate the product, such as sealed food or medical products packages. Changes in pressure may serve to stress and weaken seals and potentially expose the product to the surrounding atmosphere. Pressure differences between the inside and outside of a package may also contribute to leakage of liquid products.

It is for this reason that atmospheric conditions are part of many packaging tests, both as conditioning and test elements. In many cases test samples will be exposed to conditions in a specifically designed chamber, such as seen below.

Fig 11.a) Climate chamber

Fig.11 b) Packaging technologist working with Climate Chamber at the PTC-Packaging laboratory

3. WHAT THESE PACKAGING TESTING FACILITIES WILL DO FOR YOU?

3.1 Transport packaging testing facilities

High performance equipment are already available for use by the industry. Large Tanzanian companies have already entrusted PTC to conduct qualification tests for their transportation packaging. These services are provided under a strict protocol agreed upon with the client and performed to the highest standards. They include the full range of laboratory testing and simulation equipment (see above). Also, the service package includes the possibility of testing transport and distribution parameters live, using small portable distribution recorders placed into shipment loads that track all key physical parameters detrimental to transport packaging.

3.2 Food packaging laboratory

Ensuring perfect and safe packaging of food products is of paramount importance to preserve quality in optimum conditions. Compliance with the most demanding international standards and regulations is also required on export markets

In the context of food safety and traceability, it is necessary to understand and master the interaction between the food product and its packaging. Food suppliers are liable and need to ensure that their products are safe for human consumption. This includes the requirement for food law certificates of the packaging materials in direct contact with the food product

3.3 Climate chamber

The high performance chamber can be programmed to simulate the dynamic climatic changes the package may undergo during distribution, including simulation of positive and negative temperatures as well as humidity variations

4. GRAPHICAL & STRUCTURAL DESIGNS SECTION

A great part of this concerns surface decoration, although form, material and shape can be equally important.

In shops and super markets, one sees how different and innumerable types of products compete for sale. This competition is influenced by the attractiveness and instigating powers of the design shapes and visuals that make up the packages and labels of the products on sale.

"The foundation of a package is structural design whereas the secret of saleable package is the graphical design"**.**

The section is not yet operational; however, efforts are being made to have it soon preferably with effect from the incoming financial year 2010/2011.

5. THE NEED OF PTC FOR YOUR BETTER BUSINESS

Given the increasing globalisation, products at local and export markets are no longer unique in their physical characteristics and that differences between products with regard to their competitors are diminishing. The answer to these threats lies in the packaging orientation strategy, which is becoming more of a company's/producers' survival strategy.

Currently, Tanzania lacks packaging service organizations in the fields of education and training, quality assurance and testing and packaging design- Graphic and structural design.

Thus, full utilization of the services provided by the centre will enforce changes from production of the inferior to the quality packaging:

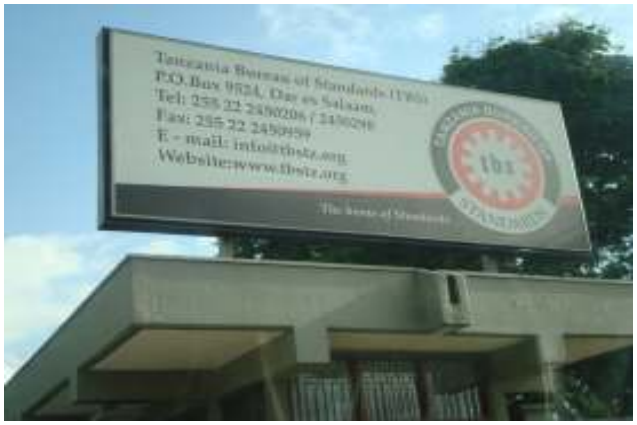
- The manufacturers including SMEs can now be provided with technical packaging services in the areas including specifications, inspection, testing, certification, training and consultancy.

- Suppliers and purchasers can as well be provided with technical assistance upon request for smooth running of their business

- Regulatory bodies may source packaging information from the centre and access to relevant packaging standards in developing regulations.

All stakeholders in the field of packaging you are therefore argued to utilize the resources of the Packaging Technology Centre for the services that the centre has already started to provide.

Packaging Technology Centre (PTC)



The rear view of the building of the Packaging Technology Centre

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