

# THE IMPACT OF PACKAGES PRODUCTION PROCESSES ON PACKAGE ERGONOMICS

(Case study of opening system of tetra pack milk package)

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## Abstract:

With its numerous combinations of size and opening/closure solutions, the Tetra pack Aseptic satisfies a great variety of liquid food packaging needs. Openings include more simple solutions, such as perforation, Pull Tab™, Flexi Cap™, and straw, or, alternatively, more sophisticated re-closeable and re-sealable openings such as ReCap™3, Stream Cap™. The problem of this study lies in presence of many opening difficulties in tetra pack packages. The paper objective is to determine the relation between cap position and package opening problems. And to determine whether the cap position affects the package opening characteristics. The study has identified that there is instability in the cap position along the research period, and that there are many kinds of cap deviations; Lateral deviations, Longitudinal deviations, Double deviations (Lateral & Longitudinal). Also it was found that, there are many degrees of cap deviations and that cap position affects the package opening ergonomics. The more cap deviation the more opening difficulties.

## INTRODUCTION

With its numerous combinations of size and opening/closure solutions, the Tetra pack Aseptic satisfies a great variety of liquid food packaging needs. Openings include more simple solutions, such as perforation, Pull Tab™, Flexi Cap™, and straw, or, alternatively, more sophisticated re-closeable and re-sealable openings such as ReCap™3, Stream Cap™. Therefore the problem of this study lies in presence of many opening difficulties in tetra pack packages.

### Tetra pack features: (1)

- 1) Made of PE/PAPER/PE/ALUMINUM/PE/PE, six-layers laminated aseptic packaging materials
- 2) Suitable for packaging of milk, juice, beverage, drinks, alcohol, tomato paste, certain kinds of jelly
- 3) The shelf life can reach to 8 - 12 months
- 4) Filling volume: 125ml, 200ml, 250ml, 1,000ml
- 5) Can be automatically filled and sealed by TBA series filling machines

6. Tetra Cap Applicator 21 attaches Re Cap opening to TBA family packages, and Slim Cap.

### Objective:

The main purpose of the present study is to study the relation between cap position and package opening problems. And to prove that cap position affects the package opening characteristics.

### LITERATURE SURVEY

#### 1. Main process steps of cap positioning: (5)

- 1) Packing material: compound paper roll for packing;
- 2) Strap sticking machine: to stick the plastic strap on one side of the paper;
- 3) Middle seam sticking: the paper is drummed-two wings is pressed together while the plastic trap sticks in the middle seam of it.
- 4) Bottom sealing: a ultrasound deviser will seal the bottoms of the boxes.

- 5) Cutting: cut down the bottom of the box for the following forming to a container.
- 6) Forming: two sucker will open the bags , then slip them on the box to the gear of the dabber and fold the angle of the bottom ,then a heater will heat the surface of the inside bottom to stick it stable.
- 7) Aseptic air heating: the boxes will aseptic by H2O2 so this part will steam the last H2O2 and make a further aseptic.
- 8) Beverage tank; the beverage material stored in this tank and prepared to be feat to the boxes.
- 9) Valve for beverage material supplying: it is controlled by a liquid control equipment to ensure the material could feed continuously.
- 10) Feeding: the material is feat with fixed quantity, it can ensure the same volume of the feeding.
- 11) Top sealing: the top of the boxes will be sealed and two angles of it will be folded to the sides well by an ultrasound sealing equipment.
- 12) All ready: the finished products will be pushed out by a push rod.

**2- The most critical attributes for evaluating the easiness of packages opening:**

There are many types of caps as shown in figure 1

The most critical attributes for evaluating the easiness of packages opening turned out to be: (2)

- Visibility and clarity of the opening mechanism,
- Keeping the grip from the opening mechanism,
- Tightness and breakage of the opening mechanism,
- Strength needed to open the package,
- need to use both hands in opening,
- Rigidity and slipperiness of the packaging material,
- keeping the grip from the package,
- Breakage of the package while opening, and



**Figure 1: Openings and closures more convenience for consumers: (3)**

- Degree of product staying inside the package after opening.

**METHOD:**

**Materials & Procedures:**

**1- Determining and Defining the Study Questions:**

- Is there an incorrect cap positioning in Egyptian tetra pack packages?
- How can incorrect cap positioning affects package opening ergonomics?

**2- Selecting the Case and Determining Data Gathering and Analysis Techniques**

- Study Case: 1.5 liters milk package. (JUHAYNA 1.5 liters milk package)
- Type of Cap: Re Cap2
- Study period: 1 year
- 3 containers per month (Every container contains 8 packages)



Figure 2: Recap 2

**3- Preparing to Collect the Data:**

*In each container the author examines the following:*

- Similarity of packages within every container
- The accuracy of lateral position (and its effect on the package opening).
- The accuracy of longitudinal position (and its effect on the package opening).
- Opening difficulties.

**4- Collecting data:**

4-1- The following table shows the results of sample examination

Month	Container	packages w lateral deviation	packages w longitudinal deviation	packages w opening difficulties
1	1	0	0	-
	2	8	0	-
	3	7	0	5
2	1	8	0	4
	2	0	0	0
	3	0	0	0
3	1	0	4	3
	2	3	5	2
	3	0	0	0
4	1	0	0	0
	2	0	0	0
	3	5	0	5
5	1	8	5	6
	2	0	0	0
	3	0	0	0
6	1	0	8	3
	2	2	8	4
	3	0	0	0
7	1	0	0	0
	2	1	0	0
	3	0	0	0
8	1	3	0	0
	2	0	0	0
	3	8	0	6
9	1	6	0	1
	2	0	0	0
	3	8	8	2
10	1	2	3	0
	2	0	7	4
	3	3	0	0
11	1	0	2	2
	2	0	1	0
	3	0	0	0
12	1	0	0	0
	2	4	0	3
	3	8	2	4

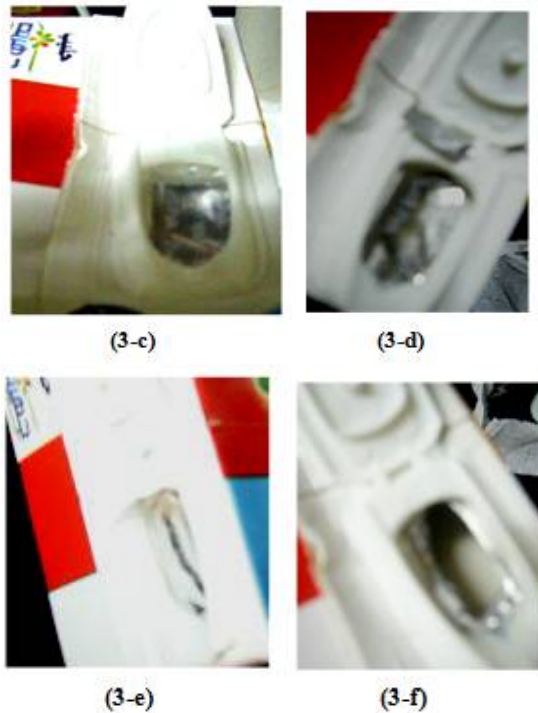
**4-2- Cap problems:**

Figure (3) shows some caps problems



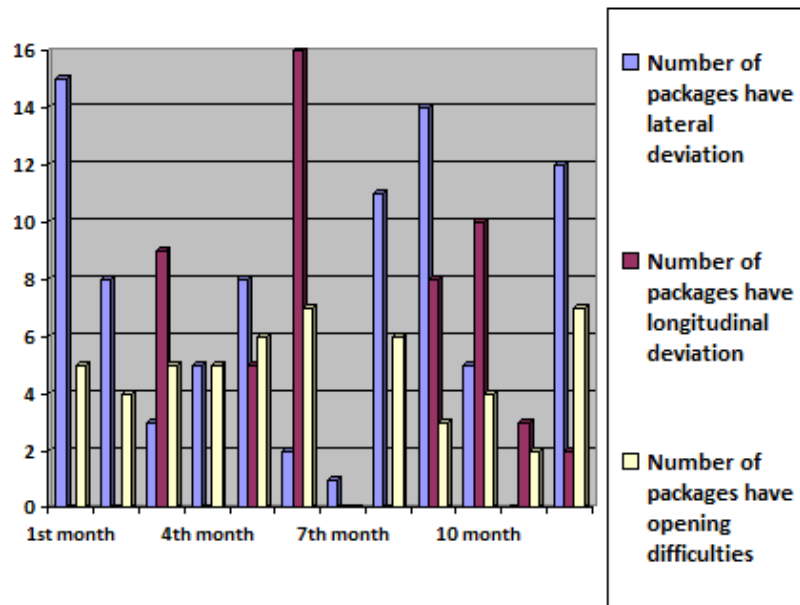
(3-a)

(3-b)



**Figure 3 some cap problems**  
**DISCUSSION**

**Figure 4** shows a chart indicates the relation between numbers of packages have cap deviations and packages that have opening difficulties along 12 months.- Vertical external deviation leads to poor grip of the package. And **that have opening difficulties along 12 months**



**Figure 4** a chart indicates numbers of packages have cap deviations and Packages

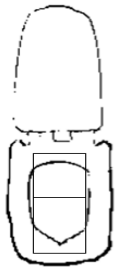
**Figure 5** shows illustrative drawing of the aluminum foil strip and the plastic cap, **figure 6** shows Figure 6: illustrative drawing of the right position of the plastic cap on the aluminum foil strip and **Figure 7** shows illustrative drawing of some kinds of deviations lead to poor opening characteristics

- There is instability in the cap position (as shown in figure 4).
- There are many kinds of cap deviations (as shown in figure 7):
  - Lateral deviations.
  - Longitudinal deviations
  - Along the study period, 30% of packages have lateral deviations.
- Along the study period, 18.4% of packages have longitudinal deviations.
- Along the study period, 19.4% of packages have opening difficulties.
- Double deviations (**Lateral & Longitudinal**)
- Cap deviations ranges from slight to extreme deviations.
- Deviation exceeding leads to opening difficulties.
- Internal longitudinal deviation leads to strip release as shown in figure (3-b).
- External longitudinal deviation leads to poor grip of the strip and strip release difficulties which may lead to strip cutting as shown in figure (4-c&d).

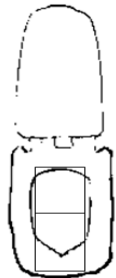
**CONCLUSION**

- There is instability in the cap position along the study period.
- There are many kinds of cap deviations.
  - **Lateral** deviations.
  - Longitudinal deviations
  - Double deviations (**Lateral** & Longitudinal)
- There are many degrees of cap deviations
- Cap position affects the package opening ergonomics.
- The more cap deviation the more opening difficulties.

**The study proves the hypothesis:** The cap position affects the package opening characteristics.



**Figure 5** Illustration of aluminum foil strip and the plastic cap



**Figure 6** Illustration showing the right position of the plastic cap on the aluminum foil strip

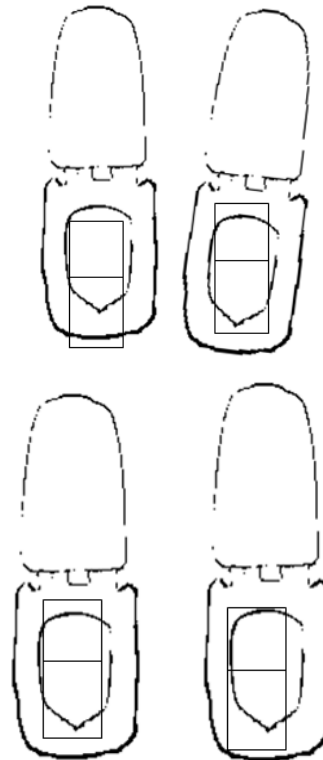
**Recommendations**

- Control lateral cap position.
- Control longitudinal cap position.

**References:**

- EC21 Global B2B Marketplace.
- Scientific background for the basis of an international standard for easy-to-open packages, EASYOPENPACK

- 2006–2008, Nordic innovation center.
- Tetra Pak Un pozzo di scienza I.T.I.S. F. Corni 27.03.09, 2008
- Tetra Pak® A3/Flex packaging lines, 2006 Tetra Pak. Code 2190 EN. 2006-03
- <http://www.ec21.com>



**Figure 7:** illustrative drawing of some kinds of deviations lead to poor opening characteristics