

Carton for milk with gable top opening

The packaging is constructed with a so-called gable-top opening and holds 1 litre. The packaging is opened in the marked part of the gable-top.

Focus areas

The milk carton's opening mechanism consists of two steps: 1) the wings are separated and pushed backwards, 2) forward push and pull whereby the spout is formed. The most critical parameter is believed to be that the opening process requires good motor skills and coordination. Therefore the analysis is based on the opening strategy and end user studies supplemented by mechanical measurement of the force needed for opening the carton.



Figure 1 Milk carton with gable top opening is examined.

REFERENCE TO GUIDELINE: Physical force, Graphics and choice of colour, Opening strategy.

Form

The packaging is not considered to be self-explanatory but as it has existed for so long most end users know how to open it. This assumption is verified by end user studies.

Design

Graphics and instructions are considered secondary; however, marking the opening side of the top is important.

Mechanical test

In order to simulate the end user's opening force it is important to choose an arrangement simulating the real opening situation closely. Figure 1 a and b show the test arrangement for measuring the opening force needed to separate the wings and to pull out the spout. The simulation of the separation of the wings seems very close to the actual situation, while pulling out the spout is measured in a significantly different way. Forming the spout is measured strictly as a pull instead of a push followed by pulling the wings. The pulling force result, however, is considered to be identical regardless whether it is a pull or a push.

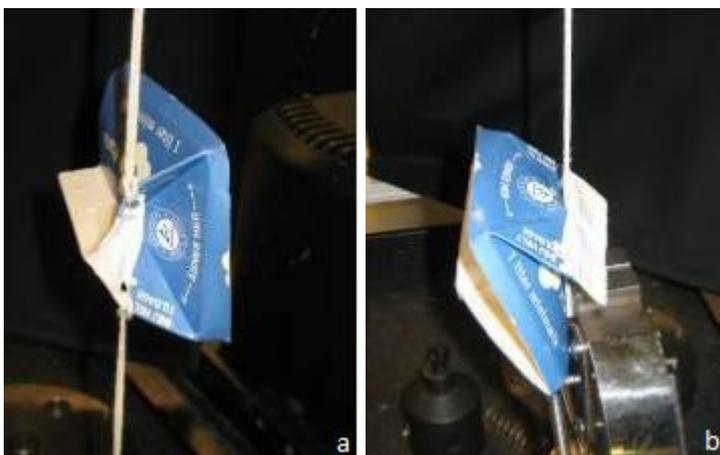


Figure 2 Mechanical measurement of pulling force for a) separating the wings (1. step) and b) forming the spout (2. step) of a milk carton.

When measuring the opening force needed a pulling force of $24\text{N} \pm 3\text{N}$ (separation of wings) and $20\text{N} \pm 9\text{N}$ (forming of spout) was found. There was a standard deviation of 9N when forming the spout for the 10 subjects tested, where minimum was 9N (two subjects) and maximum 36 N (two subjects). This variation can be due to variation in the production where the carton is closed by heat.

End user's physical force needed

A calculation model has been developed for the guideline estimating the end user's critical force needed related to different packaging types. Based on dimensions and force measured the model illustrates which people potentially could have difficulties opening the packaging. The models made for this project are based on measurements of physical force needed for flaps, pull and lift rings, arm pull and screw caps (see our calculation model in "User-friendly packaging – Guideline for the industry"). As described earlier step 2 – forming the spout and opening the packaging – is a combination of pushing with two fingers and pulling. Therefore there is no existing model able to simulate the end user's physical force needed for this exercise. The best model available is the flap model as it is based on finger strength. It is assumed that the end user is able to transfer all strength (flap length 2cm) as there is no friction problem. Out of the ten subjects tested two required a force of about 36N in order to form the spout which is significantly higher than the rest which required a force of 24N. This is of great importance for the opening friendliness as only 40 % of all women and 70 % of all men can use 36N when opening (Figure 3 a and b). Assuming that the test subjects are representatively chosen this means that 20 % of the milk cartons will need a force of 36N to open. This demands careful quality control in the production when closing the packaging.

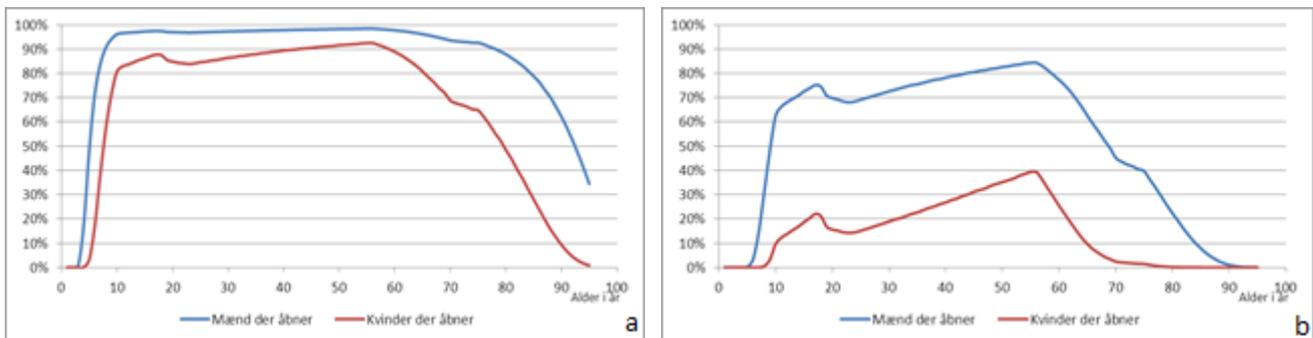


Figure 3 Share of men and women able to open 2 cm long flaps (compared with separation of wings) when the opening force is a) 24 N and b) 36N (Model based on data from DTI, UK 2002)

The measured necessary force for opening the milk carton is considered to be trustworthy. However, doubts can be justified as to whether "forming of spout" is comparable to opening of flaps. The most important question is then whether the force the end user can apply to the milk carton is larger or smaller compared with pulling a flap. Offhand the estimation will be that it is smaller as the opening technique requires good finger coordination in order to apply the maximal force. This means that a higher number of end users than the one shown in Figure 3b will experience difficulties in opening the packaging. This is further clarified in the "end user test". Further information on the model and background data can be found in the guideline under "Calculation of critical force".

End user test

In relation to an evaluation of the new technical specification "DD CEN/TS 15945:2011 Packaging. Ease of opening. Criteria and test methods for evaluating consumer packaging" user tests were conducted in 2008

at Danish Technological Institute with this type of milk cartons. Test users consisted of 29 randomly chosen elderly people in the age group of 50-90 yrs. Of these 1/3 was men and 2/3 were women. Half of the group had a physical ailment, e.g. arthritis in the hands. The group was asked to open the packaging and then evaluate how easy or difficult they found it on a scale from 1 to 5 where 1 is very easy and 5 is very difficult or impossible to open. The result is depicted in Table 1.

Table 1 End user test of how the milk carton was to open on a scale from 1-5, where 1-2 is easy to open and 4-5 is difficult or impossible to open. The test group consisted of 29 persons, men (M), women (F), with (D) or without (N) physical ailments affecting their hands. Number of persons in the group is given in parentheses

End user's evaluation of the milk carton	MD (1)	FD (14)	MN (6)	FN (10)	Total (30)
Difficult to open	0 %	15 %	33 %	0 %	13 %
Easy to open	100 %	69 %	50 %	90 %	73 %

The end users generally preferred screw caps on a milk carton as they consider this packaging as being easier to handle and more hygienic. The tested milk carton wasn't considered hard to open. Two men with no ailments (33 %) of respectively 64 and 70 yrs old found the milk carton difficult to open. This could originate from the fact that their wives open the milk carton at home and thus the men are not familiar with the packaging, that the men have poorer motor function and/or that the packaging was too hard welded and therefore difficult to open using physical force. According to the model the opening force needed for the milk carton is 36N, which means that 50-70 % of men in this age group will be able to open the milk carton. 15 % of the women with physical ailments in their hands found that the milk carton was difficult to open. The rest didn't have any problems opening it. This number is significantly lower than the model predicted which can be due to the fact that the model doesn't take this special kind of opening into consideration or possibly just the fact that the women are more used to this type of opening mechanism.

Tools for opening milk cartons exist (Figure 4), but the end users find them difficult to use. The end users having trouble opening a gable top packaging prefer screw caps also because the tools for opening screw caps are easier to handle. More information in "End user study in User-friendly packaging – Guideline for the industry". These end users keep on buying gable top packaging because it usually is cheaper than a product with screw cap.

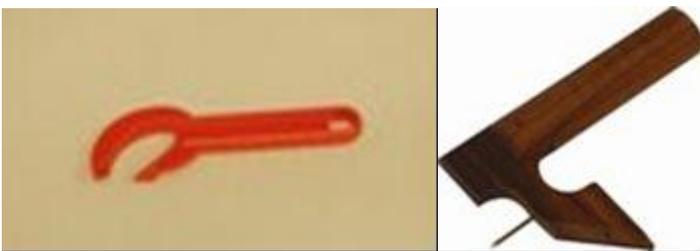


Figure 4 Examples of tools for opening gable-top milk cartons

Conclusion

Study of this packaging shows that a complicated packaging can be accepted by adaptation. The main issue concerns partly the opening strategy and partly the physical force needed. A small number of this type of packaging is very difficult to open for everybody (in the mechanical test 20 % were very difficult to open). The most obvious solution is therefore to secure a more consistent closing of the packaging and a

continuous quality control of the opening force needed. The end user solution will be to choose milk cartons with screw cap. Gable top packaging will still be sold as it costs less. Alternatively brand new opening mechanisms have to be developed.

These suggestions to improvements are pretty obvious. If the company requires more unorthodox or innovative solutions we suggest that a workshop for idea generation is held (see User-friendly Packaging - Guideline for the industry).