

## How to Improve Opening Easiness of Package

**Abstract:** This paper discusses how to improve opening easiness of plastic package.

**Keywords:** plastic package , open easiness

Opening easiness of package, mainly designed for small packages, is a kind of packaging convenience characteristic offered to consumers. In the past, we focused on how to improve sealing performance and fastness of packages to avoid damage and leakage of the contents; while opening easiness of package was rarely mentioned and the real opening result of the packages was not good. Auxiliary tools like scissors had been often used in package opening, which would often lead to hurt to hands. This not only increased the difficulty of consumption, but also affected overall images of packages. The notion of opening easiness package has come to the market for a short period of time, and is warmly welcomed by customers. Therefore, opening easiness of package has become a tendency of package design.

How to improve opening easiness of package? Could perceptual knowledge of opening easiness be quantified into several testing items? This article will give the following introduction as to container and flexible package.

### 1.Container

Container package can be divided into bottle form and cup form. Bottle package, such as plastic bottle and glass bottle, is designed to be easily opened (usually by opening bottle cap) by consumers. The needed torque force in bottle cap opening should be controlled. To some caps with special anti-fake function; opening force of pull-tab should also be controlled. Cup package is mainly opened by peeling off the sealing place or by piercing the material of cup rim using tools like suction pipe. Therefore, for different packages, seal strength or puncture resistance of materials needs to be adjusted. For example, package of children's beverage should be designed according to their grip strength and wrist strength. Generally speaking, the following parameters should be considered to improve opening easiness of package.

#### 1.1 Friction Coefficient Testing

Friction coefficient of package external wall, bottle cap surface or cap material surface should be tested.

Friction coefficient of package external wall is tested to help consumers firmly hold the bottle body, and avoid slipping when opening. Slipping phenomenon during package opening will greatly increase opening difficulties.

Friction coefficient between the bottle cap (spin opening) and its contact area with hand during opening is also very important. Generally speaking, the bigger this coefficient is, the better the result is. The screws on plastic cap is an effective measure to increase friction coefficient

Some cup packages are sealed with cap materials, with the main sealing place at cup rim. A common opening method is to peel off the sealing material at the cup rim. Therefore, friction coefficient of film surface should be increased to avoid slipping during peeling off of cap material.

#### 1.2 Torque Force Test

For container opened by cap spinning, torque test of bottle cap is necessary. At present, procedure of cap spinning

usually fulfilled with automatic cap springing device of production line after filling, during which torque force can be accurately controlled. Torque force of one batch package can be test through random sampling, and the adjustment of this torque force according to the estimated consumption group during design, a better opening effect can be realized.

### 1.3 Seal Strength Test

Some cup containers without cap are sealed with cap sealing materials, such as fruit jelly cup and yogurt cup. This kind of package quickly becomes popularized for the reason of its low in cost; and on the other hand, it can offer portable packages easy to carry and moderate in quantity. At present, the machine that combines procedures of cup body flushing, content filling, cap material sealing and finished product outputting in one has been introduced. Such machine can avoid the possible cup body pollution after production and before filling of contents. By this way, storage cost of bottle body is also saved.

The test of seal strength at cup rim is extremely important. On the one hand, sealed place of cup rim will meet impact of external force during storage and transportation with the result of cracks at the sealing places and leakage of contents owing to lower seal strength. Conversely, the seal strength being too great will increase the chances of opening difficulty when peeling off at the seal place (such as cup surface of jelly cup). Therefore, it is preferable that seal strength is controlled within a reasonable scope. Special attention should be made to the difference of cap material, cup body sealing and film sealing, especially the shape of seal head and seal width. That is why professional seal instrument is recommended in testing this item. Specialized Cup Package Seal Instrument introduced by Labthink can be customer-tailored according to the dimension of test specimen.

### 1.4 Puncture Resistance Test

Puncture resistance of cap material is needed for packages (such as yoghurt cup) opened by piecing. Different from puncture resistance test of other materials, puncture resistance of the cap material must be controlled within a proper scope: on one hand, it must be able to endure the impact of external force during storage and transportation to avoid cap material fracture; on the other hand, the package should be easily opened with tools like suction pipe.

## 2.Flexible Package Bag

Bag packages are various in forms. But it is usually for small packages that have certain requirement on opening easiness. For example, small quantity package of food and medical granules, puffed food and articles of daily use, etc. Bag package is usually opened at the provided easy aperture or at one sealing end of the package. Of course, auxiliary tools like scissors can also be used. The most ideal situation is that package can be opened conveniently without auxiliary tools; and this can comply with the portable and ready-to-use characteristics of small package to maximum extent. Taking various opening methods of flexible package into consideration, opening easiness can be improved by the following parameters:

### 2.1 Friction Coefficient

Friction coefficient of package external surface is the main factor for customers to have a film holding in order to avoid slipping phenomenon during package opening.

### 2.2 Tearing Strength Test

Opening package in the place of easy aperture is the most convenient way, which needs little strength and no auxiliary tools. So easy aperture has got wide applications in the design of flexible package. The measurement of the force needed to open easy aperture can be estimated through testing film tearing strength. Owing to different variation of the tension in vertical and horizontal orientation, this will result in aeolotropy of the produced film to some extent. It is the same case to tearing test. Therefore, based on the tearing strength of material, proper directions of aperture should be selected in the design of package structure so as to increase opening easiness.

### 2.3 Seal Property Testing

Opening package in the seal place at one end of the package is also a commonly used way. Seal place of flexible package is the main position to endure external force during storage and transportation. Therefore to secure the quality of inner content, seal strength of materials needs to be improved. On the premise that inner content of package is intact, seal strength of seal place should be reduced as much as possible. Of course, the most suitable scope of seal strength is decided by the nature of package material and the inner content, and should be decided through complete testing according to the actual condition.

### 3. The Necessity of Comprehensive Test

As to container and flexible package, this article briefs on the main influencing factors of opening easiness. However, in actual application, special attention should be paid to the comprehensive testing of relating parameters. If friction of material surface does not match with the tearing force well, the slipping will result in difficulties of opening; while the great friction will impose influences on filling efficiency of products. Therefore, it is necessary to comprehensively test the relevant opening easiness parameters of the material, and carry out opening stimulation tests under different situations.