The Effect of Various Counter Plate Methods on Creasing Quality in Carton Packaging Production

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ABSTRACT

In this study, the most used counter plate methods (ready counter plate (rillma) and crease channel) in production, based on the number of cuts, have been compared in terms of the quality of creasing. The cutting procedure is performed using a Heidelberg platen press and cardboard with a weight and thickness of 450 gr/m^2 and 0.6mm respectively. The creasing method is planned to be parallel and vertical to the direction of the carton fibre. Creasing measurements are used with the same measurements of 0.6 x 1.5mm for the creasing that are vertical and parallel to the direction of the cardboard fibre. Creasing performance of counter plates are tested after 100.000 cuts and measurements of the cardboard creasing, upon samples from every 5000 and by conforming to the BS6965 principle, are done in the "Pira Crease and Board Stiffness tester" device.

As a result of the test prints, the crease vertical to the direction of the cardboard fibre have been found to be more stable compared to those parallel to the cardboard fibre, while the crease channel of the crease parallel to the fibre have been found to be more unstable compared to crease made by the ready counter plate (Rillma) method. Preparation stage: found in the longest crease channel method and the shortest counterplate (Rillma) method. As a result, the rilma method can be preferred for high circulation orders and the crease channel method can be preferred for low circulation orders.

Key words: cardboard packaging, die cutting, creasing, counter plate

Karton Ambalaj Üretiminde Çeşitli Karşı Kalıp Yöntemlerinin Piliyaj Kalitesine Etkisi

ÖZET

Bu çalışmada üretimde en çok kullanılan karşı kalıp yöntemleri (hazır karşı kalıp ve hazır oluk yöntemleri) kesim adedine bağlı olarak piliyaj kalitesi ve maliyet açısından karşılaştırılmıştır. Kesim işlemi maşalı tipo baskı makinesinde yapılmıştır. 450 gr/m2 gramajda, 0,6mm kalınlığında karton kullanılarak kartonun su yönüne dik ve paralel olarak planlanan piliyajlar için aynı karşı kalıp ölçüleri (0,6mm x 1,5mm) kullanılmıştır. Karşı kalıpların piliyaj performansı 100.000 adet kesim yapılarak test edilmiş ve kartonun piliyaj ölçümü su yönüne paralel ve dik olarak, her 5000 adette bir alınan örnekler üzerinde BS6965 esasına uygun olarak "Pira Crease and Board Stifness tester" cihazında yapılmıştır.

Yapılan test baskıları sonucunda kartonun su yönüne dik olan piliyajlar kartonun su yönüne paralel olan pilyajlara göre daha kararlı, su yönüne paralel olan piliyajlarda hazır oluk yöntemi ile yapılan piliyajlar hazır karşı kalıp yöntemi ile yapılan piliyajlara göre daha kararsız bulunmuştur. Hazır karşıkalıp yöntemi en pahalı, hazır oluk yöntemi ise buna göre daha ucuz görünürken, en fazla hazırlık zamanı gerektiren yöntem hazıroluk yöntemi en kısa hazırlık zamanı gerektiren yöntem ise hazır karşı kalıp yöntemi çıkmıştır.

Anahtar kelimeler: Karton ambalaj, kesim, piliyaj, karşı kalıp

1- INTRODUCTION

In the production of cardboard packaging, using various methods over the press cylinder, counter plate is prepared in response to the crease knife for the crease. The crease quality that is formed at the end of the cutting procedure is affected by the printing force, cardboard properties, crease knife and counter plate properties(1). Crease quality gains importance after cutting when the box is folded in the folding-gluing stage. There can be cracking and splitting in the cardboard when it is folded especially at 180^o . A bad crease can be a reason for crooked adhesion. If the box is to be filled in the automatic filling machine, the crease quality of the box will affect the speed and performance of the filling machine.

The cutting procedure in cardboard packaging production takes place before the print is completed and before the box takes its physical shape in folding-gluing stage. With this intention, cutting dies are prepared using knives that are chosen accordingly to the design and which hold various specialities. Such knives include cutting, crease, perforation and cut-crease knives. Crease knives are used for parts of the cardboard box of the segment die that need to be folded. The creasing procedure is performed to give shape to parts of the box that need to be folded and to make sure that the folding is done properly and without any problems. Using the crease knife in the cutting die to implement the crease

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procedure is not sufficient enough. In the press cylinder, over against the the crease knife, counter plate (crease channel) needs to be prepared. The depth of the counter plate needs to be at least the same thickness as the cardboard while its width must be 1.5 times the total thickness of the crease knife and cardboard(2).

Today, counter plate is generally prepared with two methods; crease channel and ready counter plate (rillma). With the ready trough method however, machine-prepared ready crease channel of different width and depth and which have a length of 70cm are cut accordingly. On the other hand, by using a plate called "pertinaks" in blocks for every development of a box over the mould, the company preparing the cutting die with the ready counter plate method uses a computer supported production method to prepare an counter plate (Rillma). The aim of the study: To compare these two different counter plate methods in terms of the preparation process and crease quality.

2- MATERIAL AND METHOD

For the test segment, a nonprinted, one side white-grey piece of cardboard of 0.6 mm thickness and 400 g/m^2 has been used. For all two methods used to prepare counter plate, crease channel with the measurements of 1.5mm x 0.6mm have been used. The measurements of the test sample is shown in figure 1.

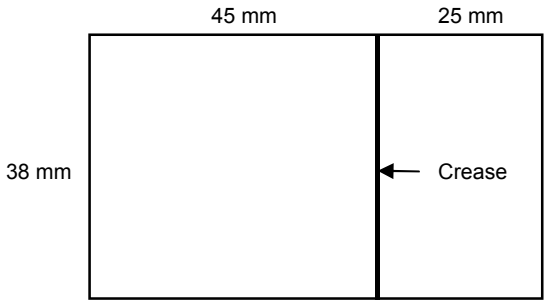

Figure 1: measurements of the test sample

The segment was cut in a Heidelberg platen press machine with a 30x40 cm dimension and 2000 sheet/hour cutting speed. With the aim of examining counter plate systems in terms of their circulation and quality, 100,000 cuts were made. By taking one sample from every 5000 segments and after conditioning to a temperature of 20^{o}C and 50% relative humidity, measurements were made according to BS 6995 principles. With this purpose the test sample needs to be 70x38mm and on the 25th millimetres of the long side of the crease. The segment mould in all two counter plate methods have been designed to be parallel and vertical in the direction of the cardboard fibre so that it covers in total four different test samples. Consequently, the dimensions of the cardboard used for cutting was taken as 165x165 mm.

To compare counter plate systems with regard to preparation time, four different sample orders have been chosen. Preparation stages and the length of two counter plate methods belonging to these samples are determined by the chronometer method.

In the preparation stage, in the use of crease channel, the number of crease and its length are factors determining its duration, for rilma, it is determined by pin and the number of boxes. The preparation times have been given in minutes along with the preparation stages.

3. FINDINGS

3.1. Preparation Times

3.1.1. Counter plate preparation time

The preparation times of all two methods have been calculated according to the minute type using the chronometer method. In the use of crease channel and the number and length of pilyaj are the factors affecting its duration while for the use of rilma, duration is determined by pim and box number.

3.1.2. Preparation time for the ready counter plate (Rillma) method

In this method, counter plate is prepared using cardboard packaging design programmes by companies that prepare cutting dies. While in the drawing stage guide pin holes are placed on the computer in appropriate places of the cutting die. The same guide pim holes, again in the drawing stage, are also placed over the counter plate.

The thickness of the cardboard is specified to the company preparing the cutting die by the producer of the cardboard packaging, which is sufficient for the preparation of the counter plate. Along with the cutting die, counter plate is also obtained. Since the outside edges are angled during production, no problem is faced when attaching the box. After the transfer is completed the operator removes the guide pims from the die.

Ready counter plates are produced as individual boxes (figure 2). The number of counter plates depends on the number of boxes in installation.

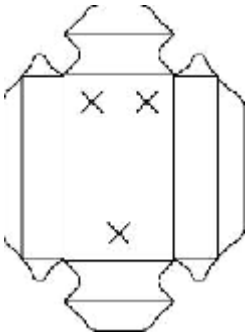

Figure 2: individual Rilma Sample (x = pim locations)

Procedures to be implemented by the operator over a counter plate of 56:

-to nail 168 pins into their places and to fix 56 individual counter plates onto these pins, (70 mins)

-to remove 56 protective bands from the counter plates, (12 mins)

-to stick the counter plates to the plate before feeding the paper into the machine

-to remove 168 pims. (30 mins)

total time: 112 mins

During the preparation stage of this method no intervention is made by the operator with regards to the trough. The performance displayed by the operator when fixing and removing the pims determines the preparation time. The number of bands on the counter plates being identical to the number of boxes effects the preperation time in a positive way. In the situation where counter plate is re-ordered it can be used without any need for preperation time.

3.1.3. Preperation time for creasing channel method

In the creasing channel method, creasing channels are cut according to the number and length of the creasing knifes and are fixed onto the die one by one after being brought to a ready state. Once the bands are removed and transferred in a way that does not allow the paper to be fed into the machine, crease channel is stuck onto the press plate. Edges of the ready trough have been angled during their production. After collecting the crease channel strips from the counter plate, we move onto the adjustment procedure.

The procedure to be implemented by the operator over a mould of 56:

-3 x 56 = 168 of 50mm

-4 x 56 = 224 of 30mm

-Cutting 4 x 56 = 224 ready trough of 12mm, (30 mins)

-Placing -11 x 56 = 616 ready trough onto the crease (60 mins)

-Removing the bands from 616 crease channel, (30 dk)

-Sticking ready trough to the plate before feeding paper into the machine.

-Removing 616 ready trough stripes from the counter plate (50 mins)

total preparation time: 170 mins.

In this method, especially with short crease, difficulties can arise with fixing and sticking onto the plate. With a large number of creases, it is directly proportional to the preperation time. In this method, operator performance is also the most important factor influencing preparation time.

3.2. Crease Quality

In the counter plate method, crease values that are vertical towards the direction of the cardboard fibre are, in two methods, almost the same and stable until the 95,000th cut, but later differ a little untill the 100,000th cut. (Figure 3)

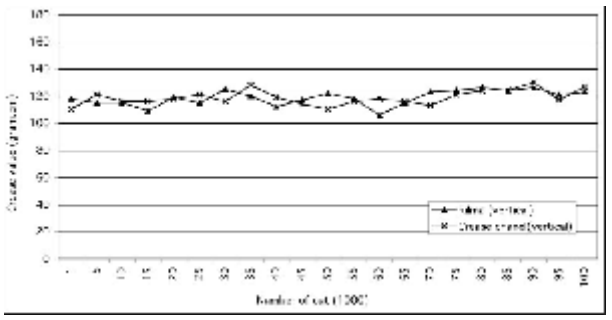

Figure 3. Crease values that are vertical towards the cardboard fibre

However, in crease that are made parallel towards the cardboard fibre, the crease values obtained from all three methods, from the beginning to the end of the test segment, are found to be independent from one another (Figure 4).

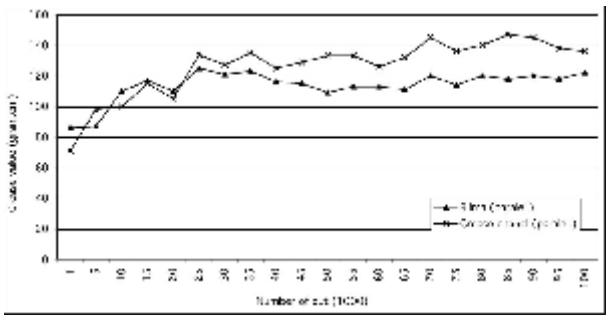

Figure 4. crease values that are parallel towards the cardboard fibre

In terms of crease values that are parallel and vertical towards the cardboard fibre, the Rilma method has been found to be more stable compared to the other (Figure5).

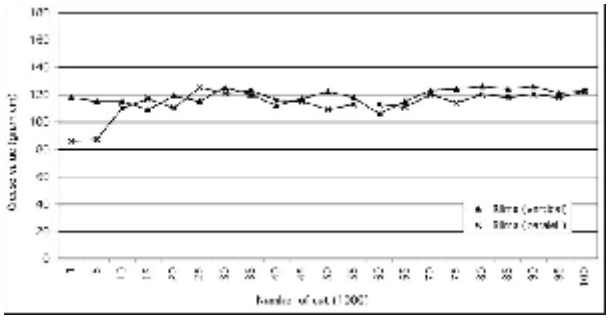

Figure 5. Obtained by the Rilma method, crease values that are vertical and parallel towards the cardboard fibre

While crease obtained by the crease channel method come second place (Figure 6-7).

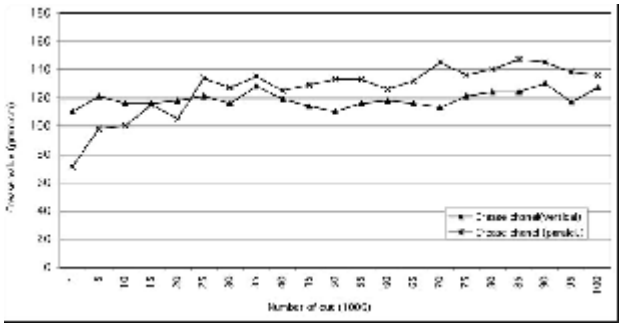

Figure 6. Obtained by the ready counter plate method, crease values that are vertical and parallel towards the cardboard fibre

4. RESULTS AND DISCUSSION

In terms of preperation time, the rilma method has been found to be more advantageous. In this method the trough arrive in the shape of boxes which ensures that the preparation stage takes less time. In the crease channel method, the time is determined by the one by one cutting and fixation of the crease.

Variable crease values of the methods used is not a desired situation. Especially during automatic filling, the differences between creasing values effects the filling procedure in a negative way. In response to the resistance shown against opening up of the crease during filling, crease values in filling that are left outside the specified gap during the adjustment lead to failures in production as a result of speed adjustments in the filling machine. The lower the resistence shown by the crease during filling, the faster and healthier the filling will be. The greater resistence of sticking boxes, such as detergent boxes, can be a reason for the adhesion to be weak and for the cover to open during the automatic filling process. Creasing with different values of the same box trigger errors such as unevenly bending towads one side during the box being opened and ripping and folding when the covers are being shut.

If the order is of high circulation and is to be filled using an automatic filling machine then the ready counter plate (rilma) method is preferred. If during cutting any viscous is dropped, no time is lost for maintenance since rilma will not be damaged.

In high circulation orders and if unique or by being large not many boxes are on the die, the crease channel method can be preferred. At high circulations, during cutting ready counterplate has a higher chance of falling and with regard to the counter plate, there is a greater risk of erosion for higher circulations.

5. REFERENCES

1- GENÇOĞLU, N., E.: “Karton Ambalaj Üretim Yöntemleri Ders Notu”, M.Ü.T.E.F., İstanbul, 1999.

2- ERDEN, M., Ç.: ”Karton Ambalaj Ders Notları”, M.Ü.T.E.F., İstanbul, 1998.

3- KARTONSAN, “Karton-Baskı-Kutu Etkileşimleri ve Karton Ambalaj”, İstanbul, 2001

4- BOBST SA, “Kesme ve Ayıklama Kalıp El Kitabı” 1994.

5- The PIRA crease and board stifness tester kullanım klavuzu, 1988