RESEARCH ON SHAPPING VEINS OF NET WRAPPER BASED ON THE COMBINATION OF ELEMENTS' MOVING AND MODELING THE PROCESS OF KINETIC BY TWO STARCH CANS

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ABSTRACT: *Net wrapper is a traditional product of Viet Nam. The domestic and foreign markets have been liked it for a few marketing years. Net wrapper is one of the girdle type which has intermingled vein. Net wrapper makes a spring roll, this is also a traditional production of Viet Nam. Vietnamese produce 20 tons net wrapper daily, such as Vissan company produces 4 tons/day to satisfy the domestic market demand.*

Net wrapper product is liked specially. Nowadays, net wrapper is still made by a handicraft, therefore, the productivity is low, it has irregular vein and insanitary. In order to replace for handle movement in the handicraft of method by using machine movement process the kinetics simulation and motion of net wrapper are one of the great important process.

In this paper we have described a kinetics shaped veins of net wrapper by the combined effects of the curved motion with rotated motion. This method allows the surmounted defect of handicraft and improving the capacity and quality of net wrapper, specially there is specifications supporting for process the designing.

1.INTRODUCTION

In this paper we have introduced the new kinetics method by means of applications of machine movement process that could replace for handle movement in net wrapper production process. This new solution will enhance quality and quantity of the net wrapper, working conditions and the hygiene conditions in net wrapper production process.

There are many methods to approach the kinetics shaped veins. In this paper, we have introduced the method that has determined the shaped veins of the net wrapper by combining effects of the curved motion of the piston with rotated motions of the trays and the other is the rotated motion of structure piston with rotated motions of the trays. This combination of motions not only defect of handicraft but also improve the density of net wrapper and these have guaranteed the technical standards of the net wrapper…Before using the parameters to serve for machine design, the kinetics shaped veins process was simulated and chosen the geometry parameters and the best kinetics for the design prosess.

2.THE HANDICRAFT METHOD

Nowadays, Vietnamese have been manufacturing net wrapper by handicraft. The workers have to work in hot environment, they use a little starch- can which has some hole then they shake their hand to follow the given trajectory, the starch will fall down a hot pan, therefore the form of net wrapper is created, but the handicraft has many defect such as low productivity, irregular vein and insanitary…

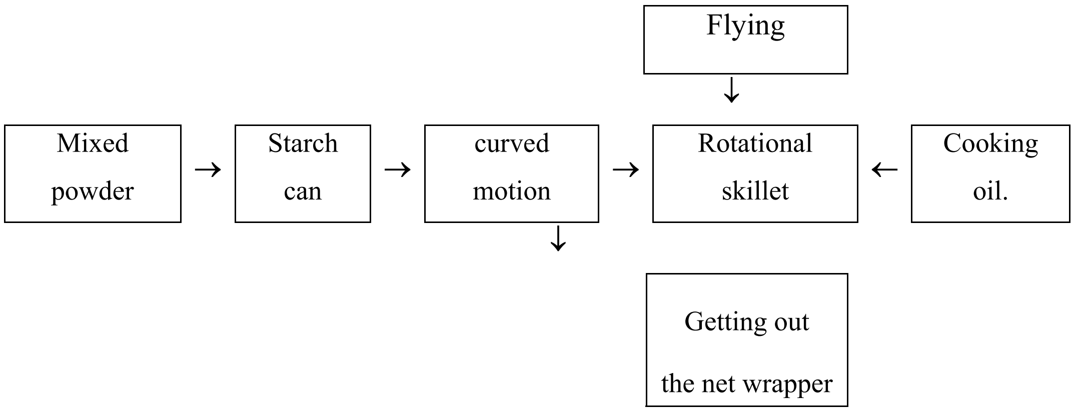

Figure 1. The diagram of production by the handicraft method

Figure 2. Net wrapper is made by Tòan Mỹ company

Figure 3. Net wrapper is made by handicraff

3.THE COMBINED EFFECT OF THE CURVED MOTION WITH ROTATED MOTION

3.1.The parameter problem

To standardize the created vein we surveyed the motions of the piston. The crank AB (of length L_1) is assumed to rotate in a angle $\alpha = w_1 \times t$ then both the connecting rod DE and FG to swing in a angle φ (Figure 4)

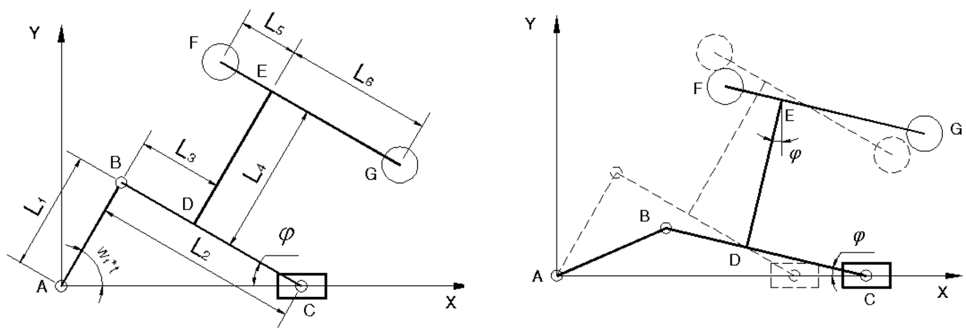

Figure 4. The motions of the piston

We can be expressed as:

$$X_F = L_1 \times \cos(w_1 \times t) + (L_3 - L_5) \times \sqrt{1-\left(\frac{a + L_1 \times \sin(w_1 \times t)}{L_2}\right)^2} + L_4 \times \frac{a + L_1 \times \sin(w_1 \times t)}{L_2} \quad (1)$$

$$Y_F = (L_2 - L_3 + L_5) \times \frac{a + L_1 \times \sin(w_1 \times t)}{L_2} + L_4 \times \sqrt{1-\left(\frac{a + L_1 \times \sin(w_1 \times t)}{L_2}\right)^2} \quad (2)$$

And

$$X_G = L_1 \times \cos(w_1 \times t) + (L_3 + L_6) \times \sqrt{1-\left(\frac{a + L_1 \times \sin(w_1 \times t)}{L_2}\right)^2} + L_4 \times \frac{a + L_1 \times \sin(w_1 \times t)}{L_2} \quad (3)$$

$$Y_G = (L_2 - L_3 - L_6) \times \frac{a + L_1 \times \sin(w_1 \times t)}{L_2} + L_4 \times \sqrt{1-\left(\frac{a + L_1 \times \sin(w_1 \times t)}{L_2}\right)^2} \quad (4)$$

If we have n hole in two starch-cans (Figure 5)

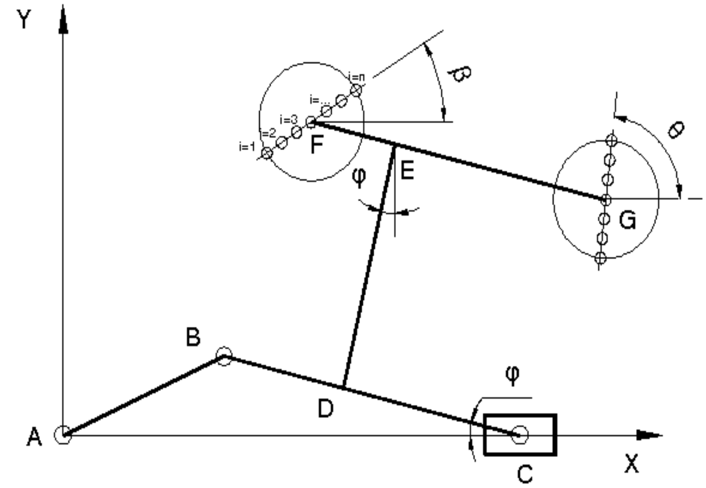

Figure 5

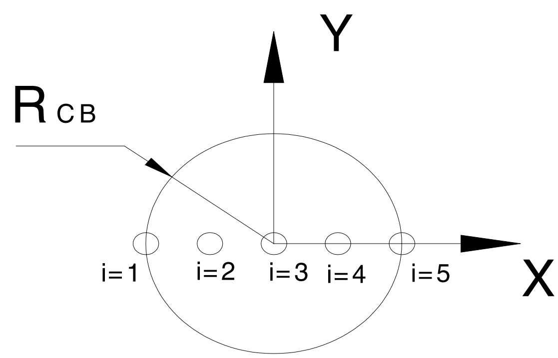

Figure 6

From Figure 6 we can be expressed:

$$X_i = \frac{(i-1)R_{CB}}{\frac{(n-1)}{2}} - R_{CB} \qquad (5)$$

(X_i is position of hole)

From Eq (5) we obtain

The equation of n hole in first starch- can:

$$(X_1)_i = X_F + \left[\frac{(i-1)R_{CB}}{\frac{(n-1)}{2}} - R_{CB}\right]\cos\beta \; (Y_1)_i = Y_F + \left[\frac{(i-1)R_{CB}}{\frac{(n-1)}{2}} - R_{CB}\right]\sin\beta \qquad (6)$$

The equation of n hole in second starch- can:

$$(X_2)_i = X_G + \left[\frac{(i-1)R_{CB}}{\frac{(n-1)}{2}} - R_{CB} \right] \cos\theta \quad (Y_2)_i = Y_G + \left[\frac{(i-1)R_{CB}}{\frac{(n-1)}{2}} - R_{CB} \right] \sin\theta \qquad (7)$$

3.2.The combined effect of the curved motion with rotated motion

$O_1x'y'$ is a co-ordinate of a net wrapper tray which is assumed to rotate in a angle $\gamma = w_2 \times t$

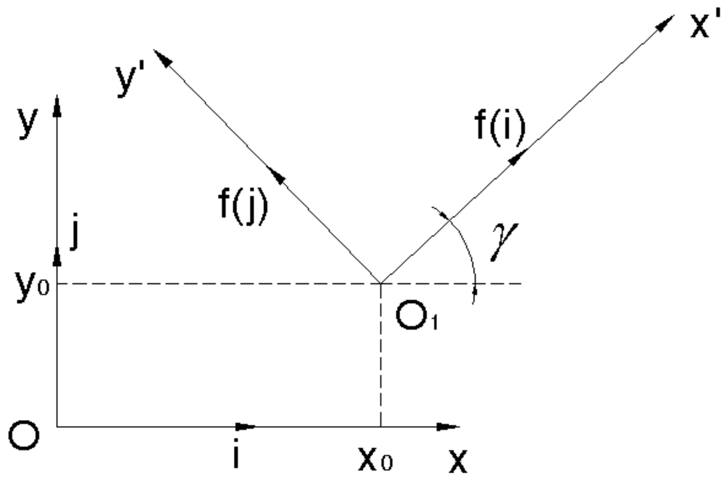

Figure 7

$O_1x'y'$ is a co-ordinate of a net wrapper tray is rotating.
Oxy is a co-ordinate of the piston.

$$\Rightarrow \begin{bmatrix} x'_1 \\ y'_1 \end{bmatrix} = [f]_E \begin{bmatrix} x_1 - x_0 \\ y_1 - y_0 \end{bmatrix} = \begin{pmatrix} \cos\gamma & -\sin\gamma \\ \sin\gamma & \cos\gamma \end{pmatrix} \begin{bmatrix} x_1 - x_0 \\ y_1 - y_0 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} x'_1 \\ y'_1 \end{bmatrix} = \begin{pmatrix} \cos\gamma & -\sin\gamma \\ \sin\gamma & \cos\gamma \end{pmatrix} \begin{bmatrix} x_1 - x_0 \\ y_1 - y_0 \end{bmatrix} \qquad (8)$$

And hence: $\gamma = w_2 \times t$

$$x_1=(X_1)_i= X_F+\left[\frac{(i-1)R_{CB}}{\frac{(n-1)}{2}}-R_{CB}\right]\cos\beta \text{ ;} y_1=(Y_1)_i= Y_F+\left[\frac{(i-1)R_{CB}}{\frac{(n-1)}{2}}-R_{CB}\right]\sin\beta$$

The general equation of n hole in first starch- can: Eq.(9)

$$x'_1=\left\{X_F+\left[\frac{2(i-1)R_{CB}}{(n-1)}-R_{CB}\right]\cos\beta-x_0\right\}\times\cos(w_2\times t)-$$
$$\left\{Y_F+\left[\frac{2(i-1)R_{CB}}{(n-1)}-R_{CB}\right]\sin\beta-y_0\right\}\times\sin(w_2\times t)$$

$$y'_1=\left\{X_F+\left[\frac{2(i-1)R_{CB}}{(n-1)}-R_{CB}\right]\cos\beta-x_0\right\}\times\sin(w_2\times t)+\left\{Y_F+\left[\frac{2(i-1)R_{CB}}{(n-1)}-R_{CB}\right]\sin\beta-y_0\right\}\times\cos(w_2\times t)$$

The general equation of n hole in second starch- can: Eq.(10)

$$x'_2=\left\{X_G+\left[\frac{2(i-1)R_{CB}}{(n-1)}-R_{CB}\right]\cos\theta-x_0\right\}\times\cos(w_2\times t)-$$
$$\left\{Y_G+\left[\frac{2(i-1)R_{CB}}{(n-1)}-R_{CB}\right]\sin\theta-y_0\right\}\times\sin(w_2\times t)$$

$$y'_2=\left\{X_G+\left[\frac{2(i-1)R_{CB}}{(n-1)}-R_{CB}\right]\cos\theta-x_0\right\}\times\sin(w_2\times t)+\left\{Y_G+\left[\frac{2(i-1)R_{CB}}{(n-1)}-R_{CB}\right]\sin\theta-y_0\right\}\times\cos(w_2\times t)$$

The complicated curves have been used to define the vein of net wrapper. For example, the curves can be defined as $\sum_{i=1}^{2}\left[(x_i)^2+(y_i)^2\right]=(R_{XY})_i^2$

where $(R_{XY})_1^2=\left\{X_F+\left[\frac{2(i-1)R_{CB}}{(n-1)}-R_{CB}\right]\cos\theta-x_0\right\}^2$

$$\left\{Y_F+\left[\frac{2(i-1)R_{CB}}{(n-1)}-R_{CB}\right]\sin\theta-y_0\right\}^2$$

$$(R_{XY})_2^2=\left\{X_G+\left[\frac{2(i-1)R_{CB}}{(n-1)}-R_{CB}\right]\cos\theta-x_0\right\}^2+\left\{Y_G+\left[\frac{2(i-1)R_{CB}}{(n-1)}-R_{CB}\right]\sin\theta-y_0\right\}^2$$

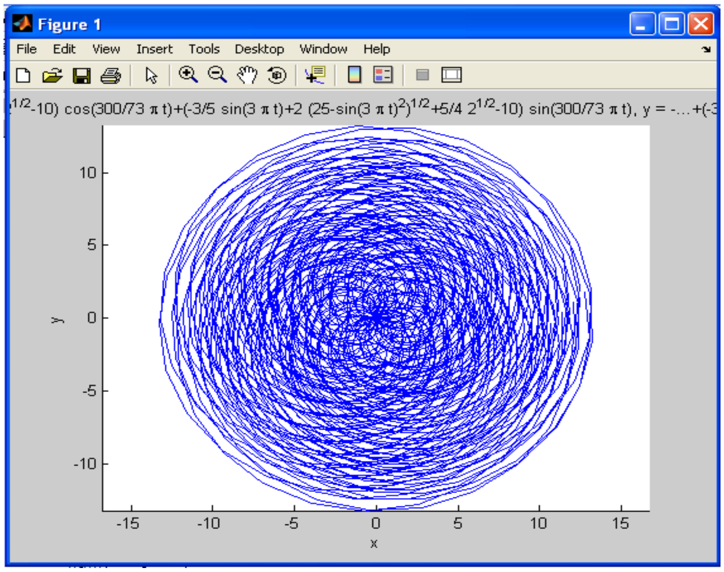

Figure 8. Net wrapper

3.3.The curved radius

One of the techical standard of the geometry qualities of the net wrapper is the curved radius. If the curved radius falls outside range of authorization. The net wrapper will break after rolling spring roll

Thus we can define the curved radius by

if we used the explicit equation then $C_i = \left| \dfrac{\overset{**}{y}_i}{\left(1+\overset{*}{y}_i{}^2\right)^{\frac{3}{2}}} \right|$ where i from 1 to 2

or

if we used the parameter equation then $C_i = \left| \dfrac{\overset{**}{x}_{\gamma i}\,\overset{*}{y}_{\gamma i} - \overset{**}{y}_{\gamma i}\,\overset{*}{x}_{\gamma i}}{\left(\overset{*}{x}_{\gamma i}{}^2 + \overset{*}{y}_{\gamma i}{}^2\right)^{\frac{3}{2}}} \right|$

where

$x_{\gamma i}\ y_{\gamma i}$ are defined by Eq (9) and Eq(10)

4.THE GEOMETRY PARAMETERS FOR THE DESIGNER

L1	L3	a	L2	n	Rcb	X0	Y0	L4	L5	L6	Beta	Theta	w1	w2
3	12.5	0	30	7	2	10	40	42	2	2.5	Pi/6	Pi/4	150rev/min	109.5rev/min

5.CONCLUSIONS

In this paper we have described a kinetics shaped veins of net wrapper by combining effects of the curved motion of the piston with rotated motion of trays.

For this reason combined maths equation of component motions, we simulated the veins of the wrapper then we proposed the parameters for the designer. As a result we can replace the handicraft method by the machine movement process to allow quality improvement and quantity by reducing the movement time and improving the quality food and the hygiene conditions in net wrapper production process.

NGHIÊN CỨU TẠO VÂN LƯỚI BÁNH TRÁNG RẾ TRÊN CƠ SỞ TỔ HỢP CÁC CHUYỂN ĐỘNG THÀNH PHẦN VÀ MÔ PHỎNG QUÁ TRÌNH ĐỘNG HỌC BẰNG HAI ĐẦU RÓT

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TÓM TẮT: *Bánh tráng rế là một trong những sản phẩm truyền thống mang đậm nét bản sắc dân tộc Việt Nam. Hiện nay bánh tráng rế đang được thị trường trong và ngoài nước ưa chuộng. Bánh tráng rế là loại bánh có vân lưới đan xen nhau. Bánh tráng rế là thành phần quan trong để làm chả giò rế. Mỗi ngày Việt nam sản xuất khoảng 20 tấn bánh tráng rế, riêng công ty Vissan sản xuất khoảng 4 tấn/ ngày , tuy nhiên với năng suất trên vẫn chưa đáp ứng nhu cầu trong và ngoài nước.*

Trong vòng nhiều thập niên qua bánh tráng rế được sản xuất bằng phương pháp thủ công, phương pháp này có nhiều khuyết điểm như năng suất thấp, vân không đều, không đảm bảo vệ sinh thực phẩm…Vì vậy để thay thế phương pháp thủ công bằng phương pháp cơ khí hoá thì việc nghiên cứu động học vân bánh tráng rế là một trong những nội dung quan trọng.

Trong bài viết này chúng tôi giới thiệu kết quả nghiên cứu quá trình tạo hình vân bánh tráng rế trên cơ sở kết hợp các chuyển động cong (từ cơ cấu tay quay con trượt) với chuyển động quay tròn (của mâm bánh). Với phương pháp này cho phép khắc phục những nhược điểm của phương pháp thủ công như năng suất lao động, chất lượng sản phẩm và giúp cho nhà chế tạo có bộ thông số kỹ thuật phục vụ cho quá trình thiết kế.

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