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Design and manufacturing of Defoiling Machine

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Abstract

Different product having different size and shape, according to that the pack size of blister is varying. When the batch start it is necessary to check the set the packaging machine according to pack size. While setting this machine many strips are carried out as the rejected strips. Some strip are rejected while printing mistake and packaging mistake. So this strips are not through it must defoiled and come to back in line. For this defoiling purpose the manual defoiling is not a correct solution. So defoiling machine is used for defoiling the tablets and capsules from the blister.

Keyword- *defoiling, PVC,PTE*

I.INTRODUCTION

Blister packages for pharmaceuticals consist of two basic packaging. Component lidding materials and forming films. The lidding materials consist of a supporting materials, e.g. aluminiumThat has a heat seal lacquer on own sides to act as a sealing agent, and on the other side an assortment of other layers depending on the end requirements of the blister package (tamper-evident, child resistance, or simple unit does delivery). The side coated with the sealing agent faces products and forming films. The forming film can be a monolayer sheet of pvc or a composite of other materials or coating to increase the water vapor barrier effect. The forming film of composite is the packaging component that receives the dosage form in deep-dram pockets. Plastic forming film such as PVC, polypropylene (PP)and polyester (PTE) can be Thermoformed, but other formable structure containing aluminum and cold light resistance is required, light-protective or opaque forming films can be employed.

Rigid PVC is currently the most widely used forming film because of its ideal thermoforming characteristics. A typical thickness before thermoforming is 250 micrometer (10mil).PVC does not provide a good barrier for moisture-sensitive product. When better barrier properties are required in a thermoform able blister. PVC is laminated or coated with other materials. Because of environmental issues, other materials such as PP completely for blister usage with PVC. In the medical device industry it has been completely replaced by materials such as PET.

There has been a considerable effort to replace PVC with PP as a support material for blister packaging its moisture barrier properties are comparable to PVDC-coated PVC in some cases. However, the processing properties of PP pose a problem. The narrow temperature range required for thermoforming PP and the temperature of the subsequent cooling process must be precisely controlled. PP packages are not as rigid as those made from PVC and PVC composites is not as problematic.

PET competes effectively with PVC medical packaging because of its strength and superior resistance to sterilizing effect. However, it is poor moisture – vapor barrier and its enhancement by PVDC are not viable because Of environmental concerns about plastics that contain chlorine. Replacing PVC with PP allows compliance with environmental standards in some pharmaceuticals markets. This material is cold from instead of being thermoformed. Such packages required more packaging materials than thermoplastic films for the packaging of the same number and same size of tablets or capsules. These coating must precisely match chemically the respective forming film (PVC, PP, or PET), a permanent sealing strength of the blister must fall within predetermined tolerances for the package to the functional.

Package access can be varied through selection of various lidding structure. The use of simple hard of soft tempered foils permits the classical push through feature of blister packages. When paper is laminated on t the

aluminum, the product is accessed by peeling of the lidding materials. For child resistance, PTE is added to the paper-foil lamination. Child resistance is achieved by peeling of the leading prior to pushing out the dosage from.

II PROBLEM STATEMENT

The strips are rejected while printing mistake and packing mistake. So this strips are not through it must de-foiled and come to back in line this is known as de-foiling.Previously de-foiling was done manually using human power which was time-consuming. By designing automated de-foiling system the de-foiling process is made cost and time effective.

III LITERATURE SURVEY

K. Chitra-2001- Validation is documented evidence which provide high degree of assurance that specific process will consistently produce product with predetermined specification and quality attributes. And it is considered as key requirement of all GMP guidelines as it enables consistent manufacturing and packaging of products in accordance with the product quality and market requirements in a cost effective and secure manner. Packaging is defined according to WHO as a process that bulk material must undergo finished product. The basic need for packaging validation is that it enables packaging process to meet the product and market requirements i.e. quality attributes and consumer needs in a cost effective and consistency efficient process with minimum down time, rejects and errors. For this purpose, the validation study for packaging process was carried out for forming temperature & sealing temperature optimization, speed optimization, efficiency of tablet feeder, Blister inspection system, print registration control, function of base and lidding foil end sensor, splice detector efficiency, shrink wrapping and impact assessment of de-blistered tablets. And this article clearly emphasizes different types of test involved in packaging validation, importance of packaging validation and key activities to achieve it successfully.

Maximilian Focke 24 feb 2010-Microfluidics is an enabling technology for miniaturisation, integration and automation of laboratory routines like production, purification or analysis of chemical compounds.1–4 These functionalities are realised in so-called Lab-on-a-Chip systems. Their fabrication usually is inspired by mass production processes known from the polymer processing industry (injection moulding) or semiconductor industry (lithography and etching). This review, however, discusses the impact of thin and flexible films as functional base materials. This approach is inspired from the huge packaging industries for pharmaceutical5 or food products.6 Good packaging not only protects the inside from damage on its way from production to the point of use7 but also provides information about its content and makes it accessible as well as applicable just as standard beverage cartons with smart mechanisms for opening and closing.8 In addition, packages must always be cost-efficiently mass-producible as well. So just consider a Lab-on-a-Chip as a ‘‘functional package’’ that encloses valuable contents like microfluidics and biochemistry! Its function is not limited to storage only—the ‘‘functional package’’ also contains the recipe inscribed in microchannels for how to combine the reagents in a perfect way to perform an assay.

IV OBJECTIVES OF BLISTER DE-FOILING

1. The strips are rejected while printing mistake and packing mistake. So this strip are not through it must de-foiled and come to back in line
2. To use the effective & low cost for de-foiling the tablets are rejected

V NEED OF BLISTER DE-FOILING

Different product having different size and shape, according to that the pack size of blister is varying. When the batch start it is necessary to check the set the packaging machine according to pack size. While setting this machine many strip are carried out as the rejected strip. Some strip are rejected while printing mistake and packing mistake. So this strip are not through it must de-foiled and come to back in line. For this de-foiling purpose the manual de-foiling is not a correct solution. So De-foiling machine is used for de-foil the tablets and capsule from the blister

VI COMPONENT DISCRIPTION

A tablet is a compressed solid unit dosage form containing medicaments with or without excipients. According to the Indian Pharmacopoeia, pharmaceutical tablets are solid flat or biconvex dishes prepared by compressing a drug or a mixture of drugs, with or without diluents. They vary in shape and differ greatly in size and weight, depending on the amount of medicinal substances and the intended mode of administration. It is the most popular dosage form and 70% of the total medicines are dispensed in the form of tablets. Tablets offer advantages over both patients and manufacturers. Tablets are the most popular dosage form due to their simplicity and economy of manufacture, relative stability and convenience in packaging, shipping and storage. For the patients, the ease of manufacturing, convenience in administration, accurate dosing and stability compared to oral liquids, tamper-profess compared to capsules, safe compared to parental dosage forms makes it a popular and versatile dosage form.

Pharmaceutical oral solid dosage forms have been used widely for decades mainly due to their convenience of administration and their suitability for delivery for delivery of drugs for systemic effects. The most commonly used pharmaceutical solid dosage forms today include granules, pellets, tablets and capsules. The tablets and capsules can be made directly from powders or from granules pellets, or from film-coated multiple units. Tablets are now the most popular dosage form, accounting for some 70% of all ethical pharmaceutical preparations produced. Tablets may be defined as solid pharmaceutical dosage forms containing drug substances with or without suitable diluents and prepared by either compression or molding methods. Hence, tablets can be broadly classified as compressed tablets and molded tablets. Compressed tablets can be further classified as directly compressible tablets, chewable tablets and tablet triturates.

VII WORKING

The blister defoiling machine works as follows:-

The position of disc and the feeder channel are adjusted according to the blister size by the use of spacer plates. The upper shaft is move upward with the lifting arrangement and required position of disc can be achieved. Disc will fixed with nuts as per adjustment of tablet spacing. As the disc and feeder channels having relative motion with respect to blister pack size.

The motion is start and is revolves the upper rubber shaft as well as lower shaft by using the geared motor wit he application of belt drive. Now the operator feed the blister through the channels it goes on the disc on the pressure is applied form top shaft so that the capsules/tablets comes down and the blister thrown toward due to revolution of shaft and we get capsules/tablets at bottom sides in tray.

Fig no 1.1 Actual View

Fig no. 1.2 working of tablet de-foiling machine

VIII DESIGN

MOTOR SELECTION

Thus selecting a motor of the following specifications

- **Single phase AC motor**
- **Power = 1/15hp=50 watt**
- **Speed= 60 rpm**

Motor Torque

$$P = \frac{2 \Pi N T}{60}$$

$$T = \frac{60 \times 50}{2 \Pi \times 8600}$$

T = 7.96N-m

Power is transmitted from the motor shaft to the input shaft by means of an open rope drive,

Motor pulley diameter = 20 mm

IP _ shaft pulley diameter = 60 mm

Reduction ratio = 3

IP shaft speed = 60/3 = 20 rpm

Torque at IP rear shaft = 3 x 7.96= **23.88 Nm**

DESIGN OF ROPE DRIVE

Motor pulley diameter **d** = 20 mm

IP _ shaft pulley diameter **D** = 60 mm

Coefficient of friction = 0.23

Let,

d= diameter of rope = 5 mm

Mass of rope per unit length is given by;

ρ= density of belt material = 950 kg/m^3

m= 0.0285 kg/m

Velocity of rope is given by;

$$\mathbf{V=\frac{\Pi dn}{60\ X\ 1000}}$$

$$V=\frac{\Pi x\ 5\ x\ 60}{60\ X\ 1000}$$

V=0.078 m/s

LINEAR VELOCITY

To find out tension in the rope is;

$$\mathbf{P=\frac{(F1-F2)V}{1000}}$$

$$50\ X\ 10^{-3}=\frac{(F1-F2)\ X\ 0.078}{1000}$$

$\mathbf{F1-F2}$ **= 636.619 N ---------- (1)**

Center distance between two pulley of motor & output pulley **C=200mm.**

$$\boldsymbol{\alpha} = \sin^{-1}\frac{D-d}{2\ C}$$

$$\alpha = \sin^{-1}\frac{(60-20)}{2\ X\ 200}$$

$\boldsymbol{\alpha = 5.739^0}$ **(In Degrees)**

$\boldsymbol{\alpha}$ =5.739 X (Π /180)

$\boldsymbol{\alpha = 0.10^c}$ **(In Radians)**

θ = Angle of lap of belt.

$$\theta = \Pi - 2\ \alpha$$

$$= \Pi - [2\ X\ 0.10]$$

$\theta = \mathbf{2.94^c}$ **(In Radians)**

$\theta = \mathbf{168.54^O}$ **(In Degrees)**

Now $\frac{F1}{F2} = e^{\wedge \frac{\mu\theta}{\sin\beta}}$

$\frac{F1}{F2} = e^{\wedge \frac{(0.23x2.94)}{\sin 19^{\circ}}}$

$\frac{F1}{F2} = 7.97$

F1= 7.97 F2 ---------- (2)

Put Eq. (2) in Eq. (1)

F1- F2 = 636.619

7.97 F2 - F2 = **636.619**

6.972 F2 = **636.619**

F2 = 91.3 N

Put in Eq. (3)

F1 = 727.69 N

Centrifugal force in belt is given by,

Fc = mV^2

=0.0285 X (0.078)^2

Fc = 1.73 N

To find diameter of shaft by ASME code

For commercial steel shaft, Actual shear stress$\tau_{act = 55N/mm^2}$

T = Π/16 x τ_{act} xd^3

$\Rightarrow \tau_{act} = \frac{16xT}{\Pi x d^3}$

$7.76^3 = \frac{16 \times 55}{\Pi \times d^3}$

d^3=737.089

d=9.033mm **select d=20mm**

4.7 Bearing selection:-

As shaft dia. is 20mm so we have selection a pedestal bearing having shaft dia. 20mm.

Motor power $P=\frac{1}{15}$ HP=50watt

N=60rpm.

Small pulley dia. d=20mm.

Big pulley dia. D=60mm.

Center dist-between two pullies C=200mm.

Shaft dia. d=20mm.

IX ADVANTAGES

1. This machine can be used for any shape of trip size.
2. This machine has compact size.
3. This machine is easy to handle.
4. Cost of machining is low.
5. Skilled person are not required.
6. Production rate can be easily changes by changing motor speed
7. Maintenance cost is less.
8. Easy to assemble and disassemble.
9. Initial investment & maintenance is low.

X. SAILENT FEATURES

All contact parts easily dismantled & cleaned.
1.Acrylic on top provided for the safety of the operator.
2. Steel parts are used in all contact parts.
3.All reclaimed Tablets/capsules are fully free from foil and plastic.
4.Fully adjustable tablets/capsules/capsules shape and strip pack configuration.
5. Machine can be easily moved at any position

CONCLUSION

It gives us immense pleasure to have completed our project Semi Automatic Defoiling Machine as per project analysis and time estimate that is in 5 months.

Our project Semi Automatic Defoiling Machine was designed on experimental basic and so adopted and chooses all channels that assure quality. After the successful completion of the complete model it is now for sure that the model can will be employed on large scale with machine increase in cost of around Rs.11000/- of semi Automatic Defoiling Machine. The present that we have developed is capable of overcoming all the drawbacks of previous and in addition will provide extra utilities such as better space utilization, remote placement of semi Automatic Defoiling Machine, added luxury, etc. Another noticeable aspect is that the maintenance is the least. The lubrication of joint is eliminated.

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