Winding

Q. What is winding? Why winding is necessary for weaving?  
Dhaka Textile-’03,’04.

**Ans:**

**Winding:** Winding is the process of transferring yarns from ring, bobbin, hank etc into a suitable package. It may be electrical or mechanical.

Warp → cone, cheese, flanged bobbin.
Weft → pirn, cop.

**Objects or necessary:**

1. To transfer yarn from one package to another suitable packages, this can be conveniently used for weaving purposes.
2. To remove yarn faults like hairiness, neps, slubs of foreign matters.
3. To clean yarn.
4. To improve the quality of yarn.
5. To get a suitable package.
6. To store the yarn.

---

Q. Mention the yarn tension level for winding.  
Noakhali Textile-’09.

**Ans:**

<table>
<thead>
<tr>
<th>Winding</th>
<th>Tension level</th>
</tr>
</thead>
<tbody>
<tr>
<td>For medium &amp; high speed up to 650 mtr/min</td>
<td>0.1x single yarn strength</td>
</tr>
<tr>
<td>Above 650 mtr/min</td>
<td>0.125x single yarn strength</td>
</tr>
</tbody>
</table>

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Q. Explain – “Yarn Tensioning Device”.

**Ans:**

During winding for controlling yarn tension, the yarn is passed into the device which is called Tensioning device. Yarn Tension plays an important role in winding. Too high a tension can damage the yarn, whereas too low a tension can lead to unstable packages which will not unwound clearly.

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Q. What are the requirements of Winding?  
Noakhali Textile-’09.

**Ans:**

1. **Minimum fault:** During winding always should be observed if yarn fault become less. (To minimize the yarn faults).
2. **No damage of yarn:** There is a dame of yarn i.e. the yarn must not be damaged in any way in the winding process.

3. **Easy unwinding:** Yarn to be wound so that it can be unwound easily.

4. **Suitable size and shape of the package:** Size and shape should be proper.

5. **Economical condition:** The package size should be controlled the particular economic requirements.

6. **Avoid excess loosened and tightness:** Should be taken care.

7. **Cheap cost of package:** The package should be cheap. Above all the process must be profitable.

Q. Describe different types of winding packages.
Describe parallel wound package or parallel winding.
Describe Near parallel wound package.
Describe cross wound package
What are the packages used both cotton and jute winding?

Ans : 

**Types of Packages:**
1. Parallel wound package: (a) warp yarn, (b) weavers yarn.
2. Near parallel wound package: (a) pirn, (b) cop, (c) Flanged bobbin.
3. Cross wound package: (a) cone, (b) cheese, (c) spool.

**Description :**

1. **Parallel wound package or parallel winding:** This comprises threads laid parallel to one another as in a warp beam. It is necessary to have a flanged package or beam; otherwise the package would not be stable and would collapse. There is no necessity of traversing.

**Advantages:**
1. Many yarn can be wound at a time.
2. No need of traversing mechanism.
3. Side withdrawal is possible.
4. The density of yarn is more.
5. No change of number of turns per inch.

**Disadvantages:**
1. Two sides of the package need flanged.
2. For yarn unwinding need separate mechanism.
3. Cannot be over withdrawl.

2. Near parallel wound package: This package comprises one or more threads which are laid very nearly parallel to the layers already existing on the package.

**Advantages:**
1. No need of flanged.
2. Can be side withdrawl.
3. No change of number of yarn turns per inch during winding.

**Disadvantages:**
1. Need of traversing mechanism.
2. Cannot be over withdrawl.

Cross wound package: This type usually consists of a single thread which is laid on the package at an appreciable helix angle so that the layers cross one another to give stability.

**Advantages:**

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Abdullah Nur Uddin Rony & Khursheedul Alam
BTEC, 2nd Batch.
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1. No need of flanged.
2. Can be over withdrawl.
3. Yarn package is stable.

Disadvantages
1. Number of yarn turns per inch is changed in this method.
2. Quality of yarn is less.
3. Need of traversing mechanism.

Package used for winding:
Cotton: cone, cheese, bobbin, pirn.
Jute: cop, spool.

Q. Describe precision and non precision winding.

Ans :
A. Precision winding: In this type of winding, successive coils of yarn on a package are laid parallel or nearly parallel to each other. Hence a very dense package is formed which contains maximum amount of yarn in a given volume.

Feature:
1. Package is wounded with a reciprocation traverse.
2. Package contain maximum amount of yarn.
3. Low stability.
4. Hard and more compact.
5. Flang may be used.
6. Dense package.
7. Unwinding process or rate is low & process is harder.
8. The wound coil is arranged parallel or near parallel.
9. Yarn tension is comparatively high.

B. Non precision winding: This type of winding, the package consists of a single thread which is laid on the package at appreciable helix angle that the layers cross one another and give stability.

Features:
1. Only one coil used.
2. Cross wound coil.
3. Less dense package.
4. Minimum yarn is stored.
5. High stability.
6. Flanged not necessary.
7. Unwinding rate is high & process is easier.
8. Soft & less compact.
9. Yarn tension is comparatively less.

Q. List the differences between precision and non-precision winding.

Ans :
<table>
<thead>
<tr>
<th>Sl. no.</th>
<th>Precision winding</th>
<th>Non precision winding</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>The wound coil arranged parallel or near parallel.</td>
<td>The coil is cross wisewound.</td>
</tr>
<tr>
<td>2.</td>
<td>The yarn density of the package is high.</td>
<td>The yarn density of the package is low.</td>
</tr>
<tr>
<td>3.</td>
<td>Flanged bobbin may be used.</td>
<td>Not use of flanged.</td>
</tr>
<tr>
<td>4.</td>
<td>The yarn package is hard and more compact.</td>
<td>The yarn package is soft and less compact.</td>
</tr>
<tr>
<td>6.</td>
<td>Winding angle is 90° or near 90°.</td>
<td>Winding angle is less than 80°.</td>
</tr>
<tr>
<td>7.</td>
<td>The bobbin is wound with one or more threads.</td>
<td>The bobbin is wound with single thread.</td>
</tr>
<tr>
<td>8.</td>
<td>Yarn tension is comparatively high.</td>
<td>Yarn tension is comparatively less.</td>
</tr>
<tr>
<td>9.</td>
<td>Unwinding rate is low.</td>
<td>Unwinding rate is high.</td>
</tr>
</tbody>
</table>

Q. Mention different types of winding machine. 

Ans:

A. **According to package:**
   1. Flanged bobbin winding m/c.
   2. Cone winding m/c.
   3. Cheese winding m/c.
   4. Pirm winding m/c.
   5. Cop winding m/c.

B. **According to winding:**
   1. Precision winding m/c.
   2. Non precision winding m/c.

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C. **According to Drive:**
   1. Direct Drive winding m/c.
   2. Indirect Drive winding m/c.

D. **According to type of yarn used:**
   • **For warp yarn:**
     1. Upright spindle winding m/c.
     2. Drum/Cylinder winding m/c.
        (a) Warp winding m/c,
        (b) cheese winding m/c,
        (c) Spool winding m/c,
        (d) Cone winding m/c.
   • **For weft yarn:**
     1. Pirn winding m/c:
        (a) Ordinary pirn winding m/c,
        (b) Automatic pirn winding m/c.
     2. Cop winding m/c.

Q. What are the requirements of a tensioning device?
Write down the factors influences fore selection for tensioner?

**Ans:**

**Requirements:**
1. The device must be reliable to control uniformly in tension.
2. It must be easily threadable.
3. It must neither introduce nor magnify tension variation.
4. It must not introduce differences in twist.
5. It must not be affected by wear.
6. It must not easily adjustable.
7. It must not be affected by the presence of oil and dirt.
8. It must not encourage the collection of dirt and dust.
9. It must be capable of easy cleaning.
10. The operating surface must be smooth.
11. It must be inexpensive or cheap.
12. It must be simple in design & operation.
13. It must not cause damage for yarn.

Q. Describe different types of tensioning devices with figure.
Describe the type of tensioner used in winding.

**Ans :**

A. **According to working principle:**
   1. Capstan tensioner,
   2. Additive tensioner,
3. Combined tensioner,
4. Automatic tensioner.

1. **Capstan tensioner:**
   - It is a simplest form of yarn tensioner.
   - In this method, the yarn is passed on and below the posts.
   - It works by merely deflecting the yarn around fixed posts.
   - This induces a capstan effect which follows the classical law:
     \[
     \text{Output tension} = \text{Input tension} \times e^{\mu \theta}
     \]

   ![Fig. 1 Capstan Tensioner](image)

   Where,  
   \( T_1 \) = Output tension,  
   \( T_2 \) = Input tension,  
   \( \mu \) = Co-efficient of friction between yarn & post.  
   \( e \) = Constant = 2.718  
   \( \theta \) = angle of lap; [ \( \theta = \theta_1 + \theta_2 + \theta_3 \) ]

   A definite input tension is required before a tension increase can be obtained, in other words, it is multiplicative device.

2. **Additive tensioner:**
   - In this device, a dead weight or spring is used to give increment of tension.
   - The yarn is passed through the middle of the surfaces in contact.
   - The force is applied from above to give suitable tension to the yarn.

   Here,  
   \( T_2 = T_1 + 2 \mu F \)

   ![Fig. 1 Additive tensioner](image)

   Where,  
   \( T_2 \) = Output tension,  
   \( T_1 \) = Input tension,  
   \( F \) = Applied force,
\[ \mu = \text{Co-efficient of friction between yarn & the surface of tensioner.} \]

3. **Combined tensioner:**
   - It is combined system of capstan & additive tensioner.
   - The device permits the tension level to be raised to any desired extent, but it does not permit a reduction in tension.
   - The only way to decrease the tension is to use a positive drive tends to overfeed.
   - Such device is seldom used.

Here, \[ T_2 = T_1 \times e^{i\theta} + T_1 + 2F\mu \]

Where, 
- \( T_2 \) = Output tension,
- \( T_1 \) = Input tension,
- \( e \) = Constant = 2.718
- \( F \) = Applied force
- \( \theta \) = Angle of lap.
- \( \mu \) = Co-efficient of friction.

4. **Automatic tensioner:**
   - This is a special type of tensioner which is able to control yarn tensioner automatically.
   - The yarn tension operated on the pin at the force end of the lever and alerts the amount of load applied in the disc region which in turn changes the tension.

   - The device is arranged so that when measured yarn tension is too high, the pressure in the disc region is reduced to bring the tension back to its proper level.
   - In control terminology, this is called “negative feed back”

**B. According to the type of working member acting on the yarn:**
1. Washer type tensioner,
2. Disc type tensioner,
3. Comb type tensioner,
4. Roller type tensioner,
5. Ball type tensioner,
6. Two-zone tensioner.

Q. Describe the methods of driving used in winding.

Ans :
Method of driving/Driving of winding package:

1. Surface contact driven,
2. Directly package driving at constant rpm/speed.
3. Directly package driving at variable rpm/speed.

1. **Surface contact driving**: In this system, the yarn package is placed with a surface contact of drum or roller. The drum is driven or rotated by the motor and machine gears and when it rotates the package also rotates in reverse direction at a constant speed.

2. **Directly package driving at constant rpm/speed**: In this system, the yarn package is placed on a spindle and the spindle gets motion by motor and gearing system. So the package gets a constant angular speed and here yarn take up rate is directly proportional to the package diameter. Here yarn is passed through a yarn
guide, yarn gets tension. Yarn is not twisted in this method.

3. **Directly package driving at variable rpm/speed:** In this method, yarn package is driven directly at varying speed. To give constant yarn speed it is necessary to cause the rotational speed to vary inversely with package radius.

**Q. Define Reversing motion. Explain different types of Reversing methods.**

**Explain:** A) Reciprocating motion; B) Rotating motion.

**Ans:**

**Reversing motion:** By the help of motion a dynamic part of a machine moves in a to and fro motion, then this movement is called reversing motion. In the package winding by the help of this motion is wound symmetrically in a package. Reversing methods are two types:-

1. Reciprocating motion
2. Rotating motion.

**1. Reciprocating motion:**

- By this motion, moving parts of a machine is passed a fixed distance & within a several time, it re-back starting positions.
- This motion is given by the help of cam. Traversing rod is connected with cam.
By the rotation of the cam moving parts of the machine gets to and fro motion.

This motion is performed in two mechanisms -
(a) A single guided rod and cam serving many winding spindles.
(b) A guide rod and cam for both spindles.

2. **Rotating motion:** Rotating motion is completed by the rotation of a grooved drum. On the surface of drums there contain grooved shape & yarn package is wound & rotates with the surface of grooved drum.
   (a) Grooved roller with single grooves.
   (b) Grooved roller with multiple grooves.

---

**Q. What is winding efficiency?**

**Ans:**

It is the percentage expression of the ratio of actual production & calculated production.

\[
\text{Winding efficiency} = \frac{\text{Actual Production}}{\text{Calculated Production}} \times 100\%
\]

Actual Production < Calculated production.

\[
\text{Efficiency loss} = \frac{\text{Calculated production} - \text{Actual production}}{\text{Calculated production}} \times 100\%
\]
Q. Mention the factor of winding efficiency.

Ans:

Related factors of winding efficiency:
1. Spindle/drum speed, 7. Maintenance & over humidity
2. Yarn count 8. Power failure
4. Worker efficiency 10. Doffing time
6. Work load per worker

Q. What is yarn guide? Describe different types of yarn guide with figure.

Ans:

Yarn Guides & necessity of yarn guides: In winding & unwinding, it is necessary to control the yarn path. For side withdrawl, it is possible for the yarn to pass along a smooth unvarying yarn path. But for over end with drawl the yarn does not move along fixed path because rotary motion is imparted the yarn winding. For a given yarn speed & package size, the position of yarn Guide will determine the balloon shape & the yarn tension.

Guides are made of hard smooth steel or ceramic.

Types of yarn guide:
1. Guides are normally made of hard smooth steel or ceramics.
2. Selection of guide shape may be depended on the yarn motion to be controlled.

Guides are two types:
1. A yarn end is required for threading.
2. A yarn end is not required for thread.
Function:
   a) To control the yarn path.
   b) Minimize yarn vibration.
   c) Reduce chance of balloon formation.
   d)

Q. What are the key parameters in winding?
Ans:
The key parameters in winding are –
   a) Slub catcher setting,
   b) Yarn tension level
   c) Winding speed.

Q. Tabulate the slub catcher setting.
Ans:

<table>
<thead>
<tr>
<th>Slub catcher</th>
<th>Yarn</th>
<th>Setting</th>
<th>Yarn diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Blade</td>
<td>Combed</td>
<td>(1.5 - 2)×D</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Carded</td>
<td>(2 -2.5)×D</td>
<td></td>
</tr>
<tr>
<td>Oscillating Blade</td>
<td>Carded</td>
<td>25% more than fixed blade.</td>
<td></td>
</tr>
<tr>
<td>1. Smooth edge</td>
<td>Combed</td>
<td></td>
<td>D = \frac{1}{28\sqrt{N}} inch</td>
</tr>
<tr>
<td>2. Serrated heavy Blade</td>
<td>Combed</td>
<td>(3 - 3.5)×D</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Carded</td>
<td>(3.5 - 4)×D</td>
<td></td>
</tr>
<tr>
<td>3. Serrated Light Blade</td>
<td>Combed</td>
<td>(4 -5 )×D</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Carded</td>
<td>(4.5 - 5.5)×D</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Polyester</td>
<td>(5.5 - 6.5)×D</td>
<td></td>
</tr>
<tr>
<td>Electronic Slub Catcher</td>
<td>Blended</td>
<td>3cm×3 ×D</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Combed</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Carded</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Q. Describe the pirn winding method with necessary sketch.

Dhaka Textile-’03,’07. Noakhali Textile-’08.

Q. Points to be considered during pirn winding. Dhaka Textile-’05.

Ans :
Pirn is used in shuttle for weft package for cotton. There are two types of pirn:
1. Ordinary pirn,
Shuttle are of two types:
1. Ordinary shuttle &
2. Automatic shuttle.

Points to be considered during pirn winding:
- Length of pirn as well as shuttle length.
- Diameter of pirn.
- Speed of winding.
- Less weight of pirn.

Feature:
The supply package is large & output package is small.
Almost no fault removing capacity.
No rejoining.
Traverse has the characteristic of an oscillation in which the package diameter is controlled continuously.
It is necessary to build bunch.
In a magazine, some full pirn are loaded which are replaced by empty pirns as & when required.
During winding, the package feels a tension. The tension is slower at begining & rises higher during winding.

Q. Describe the cone winding method with necessary sketch.

Ans:

Feature:
- Reciprocating cams which is attached with traversing guide & attached with a shaft.
- A drum is in opposite of everycone.
- Cones are placed on cone holder & kept on the contact of drum.
- Cam controls the yarn with yarn guide.

Working principle:
(i) Gets motion from motor in one side of m/c & cam shaft & drum shaft rotates by motor pully
(ii) Yarn supply gets from a bobbin & yarn go to the cone by yarn stop motion guide & yarn traversing guide.
(iii) Since cones are on holder & are contact with drum cones rotates due to the friction of drum & holder & become winding on yarn cone.
(iv) This winding is controlled with yarn guide.
(v) Winding is stop with stop motion mechanism when yarn breakage.
(vi) When cone gets predetermined width, discrete from drum contact automatically & placed new cone by taken out of the cones.

Q. Mention the yarn tensioning devices with necessary sketch.
Noakhali Textile-’09.

**Ans :**
Certain amount of tension is necessary to be imparted to the yarn to produce a compact package & to enable the weak places to break.
There are four types of Yarn tensioning devices –
a) Lever type tension, b) Disk type tension, c) Gate type tension & d) Fixed post tension.

![Diagram of Yarn Tensioning Devices]

Q. What are the different types of slub catcher or Yarn cleaner used in winding machine?
Noakhali Textile-’08,’09.

**Ans :**
Slub Catcher or Yarn cleaner is the device which is used to remove the following faults of Yarn in order to increase the Yarn quality & weaving efficiency.
The following faults are removed by Yarn cleaner :
1. Thick & thin places in the yarn
2. Slubs and neps
3. Loose fibre
4. Foreign matters.
**Yarn clearers or slub catcher:**
(i) Fixed Blade or parallel Blade type: Fixed blade slub catchers are of two types:
   (a) With fixed opening of the metal slit-for different yarn, different blades have to be used.
(b) Adjustable blade opening type - the bottom blade is fixed and the top blade is adjusted with the help of screw depending upon the yarn count.

(ii) Swinging Blade type:

Q. Discuss the broken thread stop motion in winding m/c.

Ans:
This mechanism is provided to stop the winding operation when the yarn breaks or the supply package is exhausted. On most of the machines thread is made to support a light feeler so that if no thread is present the feeler moves & contacts a notch or cam on a rocking shaft from which necessary force is obtained to disconnect the drive or lift the package from the driving drum.
1. Yarn.
2. Grid Bars.
3. Feeler wires.
4. Rod.
5. Spring
6. Plate
7. U-shaped wire
8. Rotating cam
9. Rocking shaft
10. Drum
11. Cheese Holder Arm
   Fulcrum
12. Cheese.

A sketch of the broken thread stop motion mechanism employed at Barber Colman winding is shown in Figure. A rod (4) which is free to rotate in clockwise direction due to action of the spring (5) has its bottom, feeler wires (3) & at a top a support plate (6). The feeler wires (3) rest over the running Yarn (1) which is held in position by grid bars (2). When the yarn (1) breaks, the feeler wires become free to turn forward & thus the rod (4) along with the plate (6) rotate in clockwise direction. A long U-shaped wire (7) which is suspended to the outer side of the cheese holder-arm fulcrum (11) & rests normally on a projection of plate (6) is tilted backward by another projection on the plate (c) on its (plats’) rotation. On tilting, the wire (7) comes in the way of permanently rotating cam (8) on the rocking shaft (9) and is thus pulled downward. This causes the cheese (12) to lift from the drum (10) and fall on the forward side which the rod (4) is pulled to the bottom most position of the cam (8) movement. The wire (7) again goes out of the way of cam (8) when the cheese has been lifted from the drum.

Q. Mention different types of winding m/c according to products.
Dhaka Textile-’06. Noakhali Textile-’09.

Ans :
(i) Cone winding m/c.
(ii) Cheese winding m/c.

(iii) Pirn winding m/c.

(iv) Cop winding m/c.

(v) Hank winding m/c.

(vi) Beam winding m/c.

Q. Write down the faults in winding.

Ans :

Faults in winding :

1. Yarn breakage : The main causes –
   a) Improper slub catcher setting.
   b) Incorrect tension level.
   c) Improper winding speed.

2. Stitch : The main causes of formation of stitch -
   a) Excessive spindle speed.
   b) Worn out spindle speed.
   c) Large tension variation during winding
   d) Defective release of Yarn after knotting.
   e) Improper alignment of tension bracket.
   f) Worn out or damaged grooves in the drum
   g) Improper setting of travers restricters.

3. Patterns or Ribbons : The main causes of formation of patterns-
   a) Defunct antipatterning motion.
   b) Incorrectly set antipatterning motion.
   c) Cone or chese loose filting on winding spindle.

4. Entanglements : The main causes –
   a) Repeated knotter fibre
   b) Strong suction pressure

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Abdullah Nur Uddin Rony & Khurshedul Alam
BTEC, 2nd Batch.
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c) Lack of care while knotting and releasing yarn
d) Defunct warp stop motion
e) Improper setting stop motion

5. **Wild Yarn:**
a) Yarn waste wrapped on hands of workers.

6. **Snarls:** The main causes –
   a) Faulty release of yarn after knotting
   b) Strong suction pressure in the slack tube
   c) Inadequate setting of twist.

7. **Chaffed yarn:** The main causes –
   a) Defunct stop motion
   b) Rough damaged grooves in drum
   c) Defective yarn path.

8. Formation of patches on the yarn
9. Tension variation
10. Soft bobbin
11. Tight bobbin
12. No. of less removal of slubs, neps, dirt loose fibres
13. Incorrect shape of packages.
14. The faulty shape may be due to –
   a) Faulty traverse motion
   b) Faulty yarn guide
   c) Faulty drum guide
   d) Faulty building device
15. Too much knot in the yarn
16. Two end winding
17. Slack knots or knots with long tail.
18. Overlapping
19. Mixing of yarn of difference linear density.

Q. Describe the cheese or spool winding m/c with sketch.

Ans:
When parallel package are made, then it is called cheese or spool winding m/c. Generally, cheese bobbin are made of wood or paper. It is called spool winding in jute mill & cheese winding in cotton mill. Wooden cheese bobbin are used in jute mill & paper cheese in cotton or other mill. A specific length & specific weight of yarn are wound in cheese bobbin or spool.
Features:
- Reciprocating traversing system.
- It rotates with surface contact.
- There is only one cam to wound yarn on winding drum or may be separate cam is used for each drum.
- In case of one cam, speed are moved from motor to m/c by belt.
- A traversing rod is attached with cam.
- A traversing guide are attached for each drum on the rod. Traverse guide is used as yarn guide.
- Winding yarn in wood or paper is dependent on the size of cam.
- Stop motion, slub catcher and various tensioning devices are attached with each m/c.

Working principle:
(i) Gets motion from motor in one side of m/c & cam shaft & drum shaft rotates by motor pulley
(ii) Yarn supply gets from a bobbin & yarn go to the cheese or spool by yarn stop motion guide & yarn traversing guide.
(iii) Since Cheese or spool are on holder & are contact with drum cheese or spool rotates due to the friction of drum & holder & become winding on yarn cone.
(iv) This winding is controlled with yarn guide.
(v) Winding is stop with stop motion mechanism when yarn breakage.
(vi) When cheese or spool gets predetermined width, discrete from drum contact automatically & placed new cone by taken out of the cheese or spool.
It is better to use separate cam than using only one cam, because if somehow the cam damaged, then full m/c is stopped. On the other hand, In case of separate cam, if cam is damaged, then the winding yarn by that cam is stopped but other do not stop.

Q. Differentiate between cone winding & cheese winding.

<table>
<thead>
<tr>
<th>Sl no.</th>
<th>Cone winding</th>
<th>Cheese winding</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>It is a conical package.</td>
<td>It is a parallel package.</td>
</tr>
<tr>
<td>2.</td>
<td>The traversing system of cone winding m/c is rotating.</td>
<td>The traversing system of cheese or spool winding m/c is reciprocating.</td>
</tr>
<tr>
<td>3.</td>
<td>Package rotate with surface contact &amp; variable speed.</td>
<td>Package rotate with surface contact or variable speed.</td>
</tr>
<tr>
<td>4.</td>
<td>It is used largely</td>
<td>It is used less than cone winding</td>
</tr>
<tr>
<td>5.</td>
<td>It is used in weft insertion of shuttleless loom</td>
<td>It does not used</td>
</tr>
<tr>
<td>6.</td>
<td>Cone is used in warping m/c</td>
<td>Cheese/spool is used in warping process.</td>
</tr>
<tr>
<td>7.</td>
<td>Cone is used in knitting m/c.</td>
<td>Cheese or spool does not used in knitting m/c.</td>
</tr>
</tbody>
</table>

Q. State the Importance or Effects of tensioning Device.

Ans :

**Too high tension:**
(a) Can damage the yarn.
(b) Breakage rate may greater.
(c) Elongation properties may change.

**Too low tension:**
(a) Can lead to unstable or loose packages which will not unwind cleanly.
(b) Variation in yarn tension in different parts of a wound package can cause undesirable effects.

• For MMF:
  ➢ Too high tension :-
    (a) Can cause molecular change which effects dye ability.
    (b) Random variation in colour shading.

• For Staple or Spun yarn:
  ➢ Too high tension :-
    (a) May breakage at thin place.
**Q. State the auxiliary functions in winding. Explain them.**

**Ans:**

1. **Creeling:** Creeling is the placement of full packages in position ready to be unwound as part of the transfer operation. Alternative meaning is the removal of the exhausted packages & their replacement with full ones.

2. **Doffing:** Doffing is the removal of the newly wound packages & usually the replacement of these by empty packages which will receive yarn during the transfer process.

3. **Piecing:** Piecing is the finding & connecting of the ends on the packages. The connecting between the ends can be made by knotting, adhesion or welding.

**Q. Compare between ordinary & automatic shuttle.**

**Ans:**

<table>
<thead>
<tr>
<th>Sl. no.</th>
<th>Automatic shuttle</th>
<th>Ordinary shuttle</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>There is no spindle.</td>
<td>There is spindle.</td>
</tr>
<tr>
<td>2.</td>
<td>Threading is done automatic.</td>
<td>Threading is done normally.</td>
</tr>
<tr>
<td>3.</td>
<td>Three metallic rings are present in this shuttle.</td>
<td>Ordinary pirn is used.</td>
</tr>
<tr>
<td>4.</td>
<td>Automatic pirn is used.</td>
<td>Ordinary pirn is used.</td>
</tr>
<tr>
<td>5.</td>
<td>Fixing of pirn in shuttle is done automatically.</td>
<td>Fixing of pirn in shuttle is done ordinary.</td>
</tr>
</tbody>
</table>
Mathematical Problem

Q. Calculate the time required winding 400 lb of 12’s cotton on 10 drums. The actual production per drum per min 560 yds.

Ans :

Actual production per drum per hr = \( \frac{560 \times 60}{12 \times 840} \) lb
= 3.33 lb

Time required = \( \frac{400}{3.33 \times 10} \) = 12 hrs. (Ans)

Q. How much time will be required to wind 2388 lbs of 20’s cotton on 40 drums of a super speed cone winder, if the calculated of winding is 1298 yds per min & the efficiency is 80%.

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Ans:
Actual production per drum per hr = Calculated rated of winding in
\[ \text{min} \times \text{Efficiency} \times 60 \]
\[ = 1298 \times \frac{80}{100} \times 60 \text{ yds} \]
\[ = \frac{1298}{840} \times \frac{80}{100} \times 60 \text{ Hank} \]
\[ = 74.17 \text{ Hank} \]
Time required = \( \frac{2388 \times 20}{74.17 \times 40} \) = 16 hrs. (Ans.)

Q. Calculate the production of a super speed cone winding machine from the following particulars :
R.P.M of the winding drum = 4956
Diameter of winding drum = 3 inch
Efficiency of the machine = 30%
Production/min = ?

Ans:
Production = \[ \frac{\pi \times \text{diameter of winding drum} \times \text{r.p.m of drum} \times \text{efficiency}}{36 \times 100} \]
\[ = \frac{3.14 \times 3 \times 4956 \times 80}{36 \times 100} \text{ yds} \]
\[ = 1037.456 \text{ yds. (Ans.)} \]

Q. Calculate the production of a cone winding machine from the following particulars :
R.P.M of the winding drum = 1200
Diameter of winding drum = 4 inch
No. of drums = 120
Count of the yarn = 32"
Efficiency of the machine = 70%
Production/hrs = ?

Ans:
Pr assailance = \( \frac{\pi \times \text{dia of drum} \times 60 \text{ min} \times \text{hr} \times \text{efficiency} \times \text{no. of drums}}{36 \times 840 \times 100 \times \text{count of yarn}} \) lb

= \( \frac{3.14 \times 4 \times 1200 \times 60 \times 8 \times 70 \times 120}{36 \times 840 \times 32 \times 100} \) lb

= 628 lb (Ans.)

Q. Calculate the production of a super cone winding machine from the following particulars:
R.P.M of the winding drum = 3012
Diameter of winding drum = 3 inch
No. of drums = 120
Count of the yarn = 32\(^{\circ}\) (Ne)
Efficiency of the machine = 90%
Production/8hrs = ?

Ans :

\[ \text{Production} = \frac{\pi \times \text{dia of drum} \times \text{r.p.m. of drum} \times 60 \text{ min} \times \text{hr} \times \text{efficiency} \times \text{no. of drums}}{36 \times 840 \times \text{count of yarn} \times 100} \] lb

= \( \frac{3.14 \times 3 \times 3012 \times 60 \times 8 \times 90 \times 120}{36 \times 840 \times 100 \times 32} \) lb

= 1519.98 lb (Ans.)

Q. Calculate the time required for winding 60,000 lbs of 54\(^{\circ}\) yarn on 500 high speed winding drums each of which has a calculated rate of winding of 630 yds. The efficiency 90%.

Ans :

Actual production per drum per hr = \( \frac{630 \times 90 \times 60}{100} \) yds

= 34020 yds

Time required = \( \frac{\text{Quality of yarn to wound in lb}}{\text{Actual production in lb/spindle per hr} \times \text{No. of drum}} \)

= \( \frac{60000 \times 54}{34020 \times 500} \) hrs.

= 160 hrs. (Ans.)

Q. Calculate the time required for winding a cone from the following data:
Weight of yarn on the cone = 2 lbs
Yarn count = 40\(^{\circ}\) (Ne)
Circumference of the drum = 20 inches
R.P.M. of winding head = 200
M/C efficiency = 80%.

\textbf{Ans :}

\[
\text{Actual production/hr} = \frac{20 \times 200 \times 0.8 \times 60}{36 \times 840 \times 40} = 0.15870158 \\
\approx 0.159
\]

Time required = \frac{2}{0.159} \text{ hr}
= 12.58 \text{ hr}

\textbf{Q.} The output (actual) per spindle per min of an automatic super speed pirn winder is 672 lbs of 12\(^{\circ}\) cotton yarn. Calculate the time that will be required to wind 1200 lbs of yarn on 30 spindles.

\textbf{Ans :}

\[
\text{Time required} = \frac{\text{Quality of yarn to wound in lb}}{\text{Actual production in lb/spindle per hr} \times \text{No. of drum}}
\]

Actual production in lb/spindle per hr = \frac{672 \times 60}{840 \times 12} = 4 \text{ lbs}

Time required = \frac{1200}{4 \times 30}
= 10 \text{ hrs (Ans)}

\textbf{Q.} Calculate the time required to prepare 9 sets of a 8 warpers beam each on 2 super speed beam warping m/c. The calculated prod\(^{\text{th}}\) of the m/c is 30,000 yds per hr & the length of warp on each beam is 20,000 yards. Assume 85\% efficiency.

\textbf{Ans :}

Total length of warp in yards to be warped = 20000 \times 9 \times 8 \text{ yds}
= 1440000 \text{ yds}

Actual production per hr per m/c = \frac{30000 \times 85}{100} \text{ yds}
= 25500 \text{ yds.}

\textbf{PREPARED BY:}
Abdullah Nur Uddin Rony & Khurshedul Alam
BTEC, 2\textsuperscript{nd} Batch.
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Time required = \[
\text{total length of warp in yds} \div \text{actual production per hr per m/c } \times \text{no. of m/cs}
\]
\[
= \frac{1440000}{2550 \times 2}
\]
\[
= 28.24 \text{ hrs (Ans)}
\]

Q. The rate of winding (calculated) of modern high speed cone winding m/c is 800 yds per min. Calculate the no. of drums required to wind 388 lbs of 40s frinaring bobbin in 8 hrs. If efficiency is 84 % , Allow 1% for waste & left on the bobbins.

Ans :
Actual production per drum per hr = \[
\frac{800 \times 60}{840} \times \frac{84}{100}
\]
\[
= 48 \text{ hank.}
\]
Quality of yarn to be wound = 388-1% = 384 lbs
No. of drums required = \[
\frac{384 \times 40}{48 \times 8}
\]
\[
= 40 \text{ (Ans)}
\]

Q. Calculate the number of spindles of a modern automatic pirn winder that would be required to wind 280 lbs of 20s in 8 hrs. If the production per spindle per hr is 1.4 lbs.

Ans :
Quality to be wound = 280 lbs.
Actual production per spindle per hr = 1.4 lbs.
No. of spindles = \[
\frac{280}{1.4 \times 8}
\]
\[
= 25 \text{ spindles (Ans)}
\]

Q. The rate of winding (calculated) of modern high speed cone winding m/c is 980 yds per min. Calculated the no. of spindles that would be required to wind 3024 hanks of 20s cotton yarn in 4 hrs. Ignore wastage & assume efficiency 90%.

Ans :
Actual production per spindle per hr = rate of winding calculated per min \times 60 \times eff.
\[
= \frac{980 \times 60 \times 90}{100 \times 840}
\]
\[
= 63 \text{ hank.}
\]
Quality to be wound = 3024 hanks.
No. of spindles = \( \frac{3024}{4 \times 63} \) = 12 spindles (Ans)

Q. Yarn are required to wind 1600 lb of 46\(^{th}\) cotton in 8 hrs on a high winding m/c with 651 yds as the rate of winding (calculated) of the m/c runs with 92\% efficiency. How many drums would be required?

**Ans:**
- Quality to be wound = 1600 \( \times \) 46 = 73600 hanks.
- Actual production per drum per hr = \( \frac{651 \times 92 \times 60}{840 \times 100} \) = 42.78 hanks.
- No. of drums = \( \frac{73600}{42.78 \times 8} \) = 215 drums (Ans)

Q. The winding drum of a high speed cone winder having a diameter of 3 inch makes 2870 r.p.m. The actual amount of yarn wound in 9 hrs was found to be 332,838 yds. What is the efficiency?

**Ans:**
- Calculated production in 9 hrs = \( \pi \times \frac{3}{36} \times 2870 \times 60 \times 9 \) yds
  = 405531 yds.
- Efficiency = \( \frac{\text{Actual production}}{\text{calculated production}} \times 100 \)
  = \( \frac{332838}{405531} \times 100 \)
  = 82\% (Ans.)

Q. Production of pirn winding m/c per shift per spindle is 10 lbs for 30\(^{th}\) cotton yarn. If the m/c runs at 600 yds/min calculate efficiency.

**Ans:**
- Calculated production per spindle per shift = 600 yds per min
  = 600 \( \times \) 60 \( \times \) 8 yds per hr
  = 288000 yds per hr.
- Actual production per spindle per shift = 10 \( \times \) 840 \( \times \) 30 yds
  = 252000 yds

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Efficiency = \( \frac{\text{Actual production}}{\text{calculated production}} \times 100 \)

= \( \frac{252000}{288000} \times 100 \)

= 87.5\% (Ans.)

Q. An ordinary slow speed warping m/c is working with 40\textsuperscript{s}. The prod\textsuperscript{n} of the m/c is 21,000 yds per day of 9 hrs. If it is required that creeling is to be wounded on the supply package, allowing 5\% for wastage & mtl left on the bobbins.

Ans:

Length of yarn = 21000 + 21000 \times \frac{5}{100} \text{ yds}

= 22050 \text{ yds.}

wt. of yarn to be wound on each bobbin = \( \frac{22050}{840 \times 40} \) \text{ lbs}

= 0.656 \text{ lb per 9 hrs (Ans)}

Q. Calculate the no. of warper beam & length of warp that can be made from 1500 cones, each of which contains 1.5 lbs of 40\textsuperscript{s} cotton yarn. Total no. of ends required is 3000.

Ans:

Total wt. of yarn in lb = 1500 \times 1.5 \text{ lbs}

= 2225 \text{ lbs}

Length of warp in yds = \( \frac{\text{wt of warp in lb} \times \text{count} \times 840}{\text{No. of ends}} \)

= \( \frac{2225 \times 40 \times 840}{3000} \) \text{ yds}

= 2520 \text{ yds (Ans)}

\therefore \text{No. of beams} = \( \frac{\text{Total no. of ends}}{\text{No. of cones}} \) = \( \frac{3000}{1500} \) = 2 (Ans.)