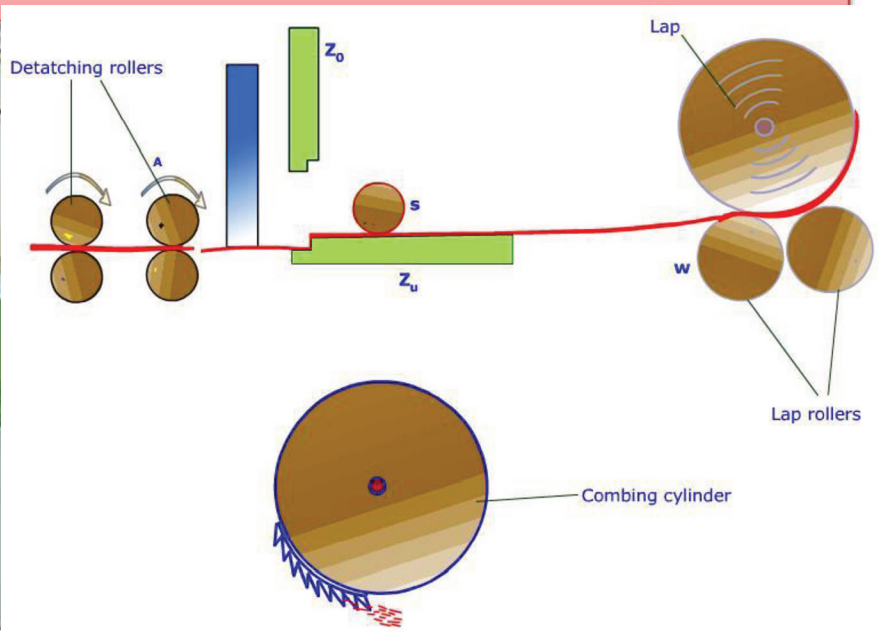
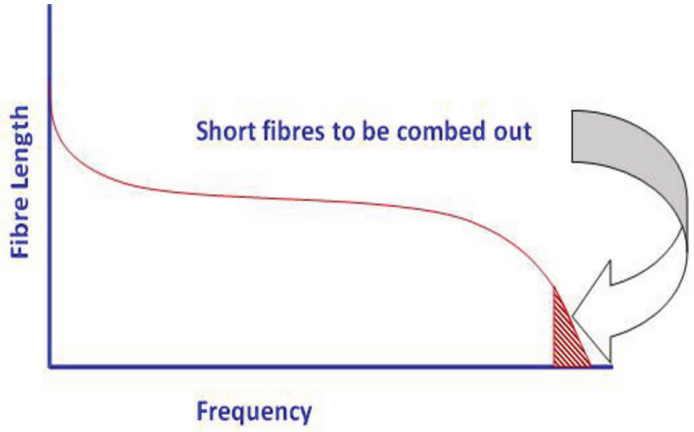
CHAPTER FOUR
COMBING



By: Lami A.

COMBING

➢Combing process removes predetermined level of short fibres from the group of cotton fibres. It is well known that the cotton fibres have distribution of fibre lengths starting from long to very short fibres as shown in Figure below; a typical fibre length distribution diagram for cotton fibres is indicated.



❑Combing process main objectives are the removal of short fibres, Removal of neps, fiber parallelization and removal of remained trash and impurities. Removal of short fibres leads to better yarn quality in terms of high yarn strength, better evenness, as short fibres less than 12mm do not contribute much to the strength or evenness and in fact, are negative factors in this regard.

➢ They only increase the hairines of the yarn and adversely affect the appearance and other good properties of the yarns and the fabrics made out of them.

➢The short fibres removed in the combing process is called as “noils”. It is usually referred as a percentage of the total amount of material feed to the comber.

➢The amount of noils removed depends upon the industry and the needs ranging from 8 to 25%.Elimination of short fibers produces an improvement mainly in staple length , but it also affects the fineness of the raw material.

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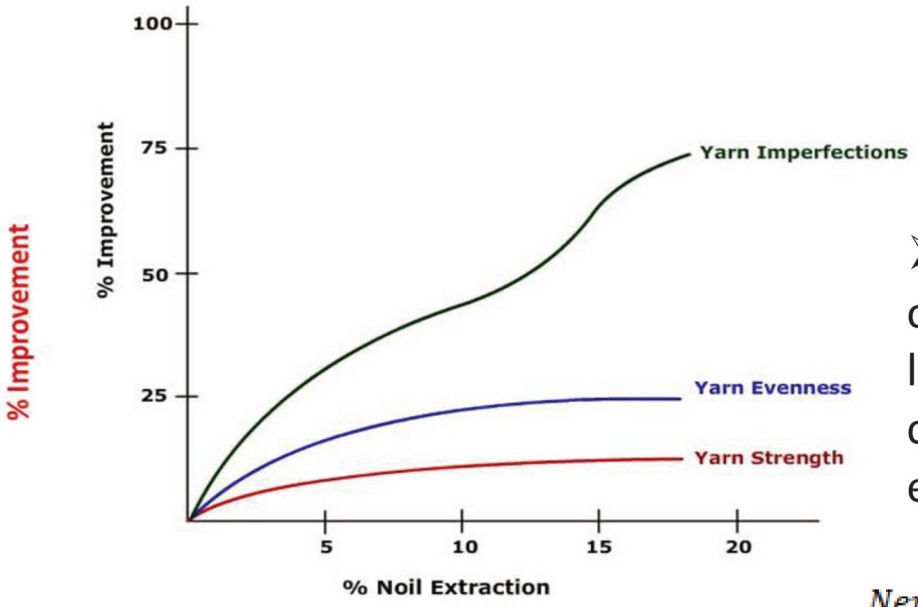


➢Noil percentage is the ratio of Noil weight to the total wt of sliver & noil

$$Noil\ \% = \frac{Noil\ Wght}{Sliver\ Wght + Noil\ Wgh} *100$$

➢Neps removal efficiency is the percentage ratio of the difference between Neps/gm in comber lap & Neps /gm in comber sliver to Neps/gm in comber lap. Neps removal efficiency is expressed as NRE%

$$Noil\ \% = \frac{Neps/gm\ in\ comber\ lap - Neps\ /gm\ in\ comber\ sliver}{Neps/gm\ in\ comber\ lap} *100$$

➢the short comings of combing process are:

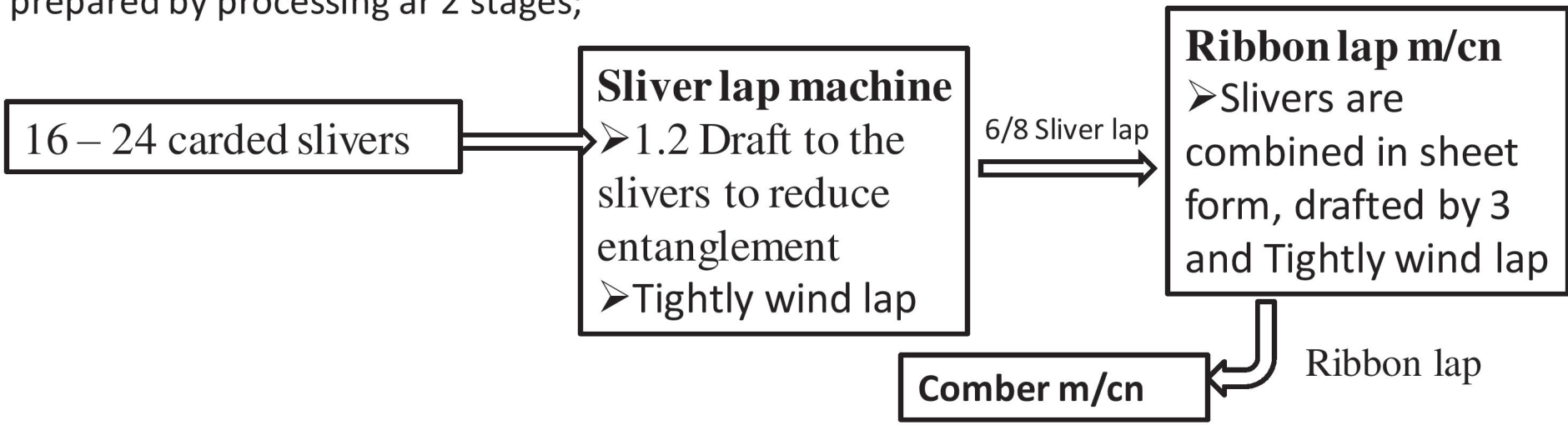
1. **Increase capital cost and floor space:** Requires insertion of mostly three machines into the normal spinning process between card and draw frame which ***also needs more space with conditioned atmosphere***

2. Increase yarn cost: It serves as additional system to improve yarn quality if the carded yarn does not meet requirements. ***Additional three machines plus energy***

3. Minimum productivity: it works on intermittent processing basis . The entire mass of the nipper assembly has to be accelerated to the maximum speed and slowed down to zero about 7.5 times a second.

PRE COMBING/LAP *PREPARATION FOR COMBING*

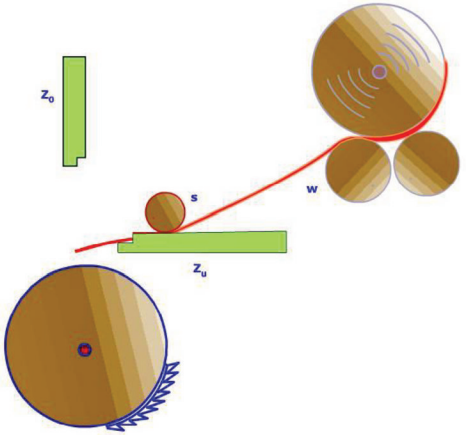
➢Majority of the fibre hooks in a carded sliver are trailing. Hooks can be straightened out by comber needles provided they are presented in leading position. If the trailing hooks are presented as such, they behave like short fibres and removed as noil. So before feeding to combing, carding slivers are prepared by combing preparatory machines in order to present the hooks in proper orientation. The feed material to the comber - the comber lap - can be prepared by processing ar 2 stages;

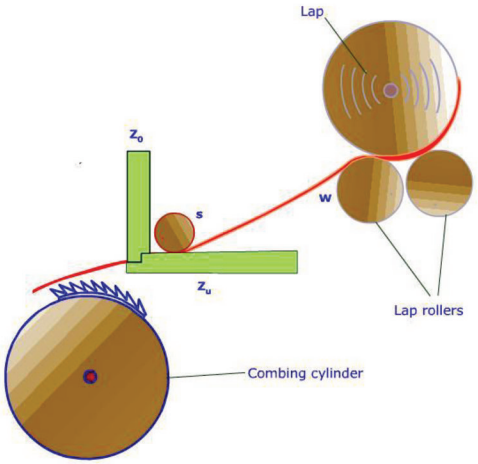


➢ In the modern method, instead of sliver lap and ribbon lap, a single machine called superlap (with similar names) produces the lap that is fed straight to the comber.

THE COMBING PROCESS

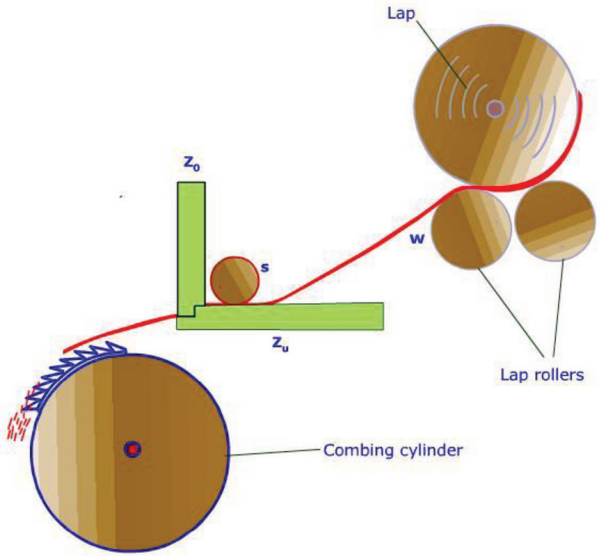
✓**Feeding:** Feed rollers **(S)** move lap sheet **(W)** unwind by lap rollers forward by a small amount (4.3 - 6.7 mm), while the upper and lower nippers **(Zo/Zu)** are kept open (feed)



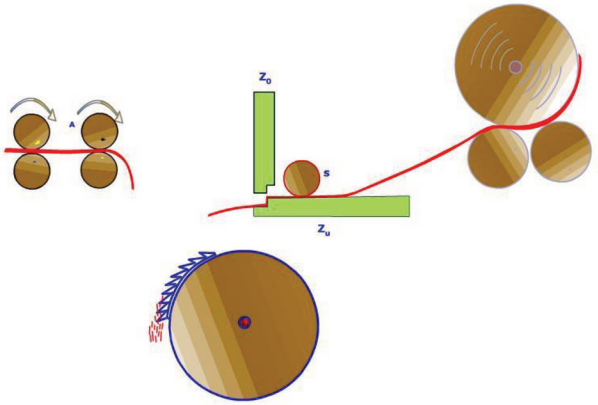


✓**Nipping :**Upper nipper plate **Zo** is lowered onto cushion plate **(Zu)** so that the fibers are clamped between them

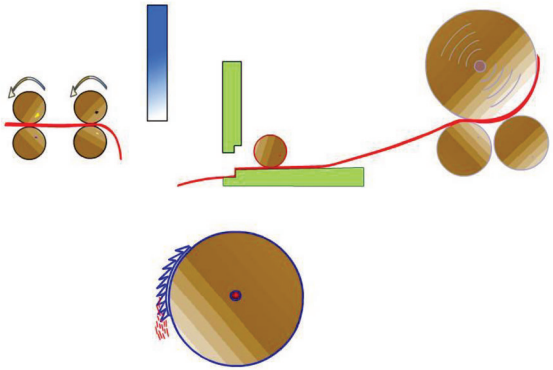
✓**Combing:** Combing segment **(K)**, mounted on rotating cylinder **(Z)**, sweeps saw-teeth through fiber fringe **(B)** and carries away anything not held by the nippers (rotary combing).

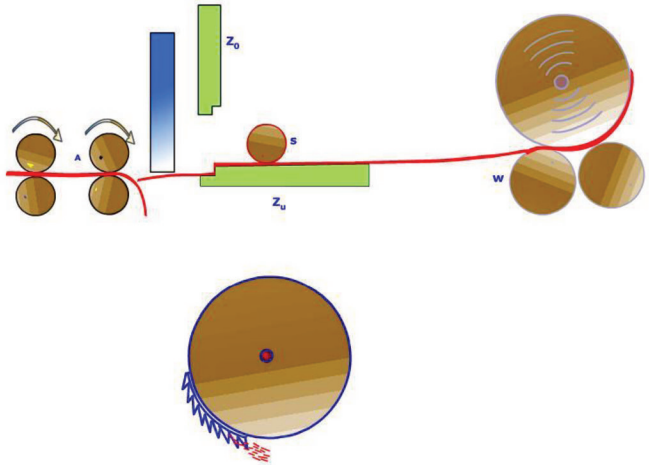


✓**Nippers forward:** The nippers open again and move toward detaching rollers **(A).**

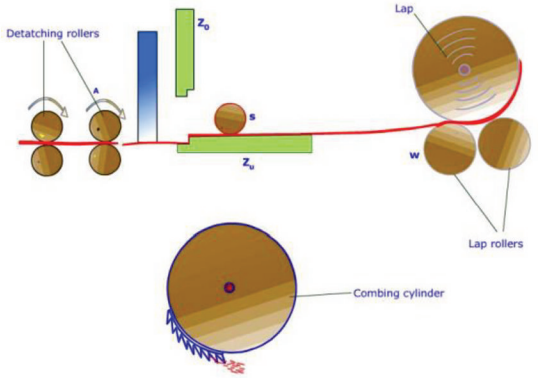


✓**Web return:** Meanwhile detaching rollers **(A)** have returned part of the previously drawn-off stock **(web V)** by means of a (partial) reverse rotation, so that the web protrudes from the back of the detaching device



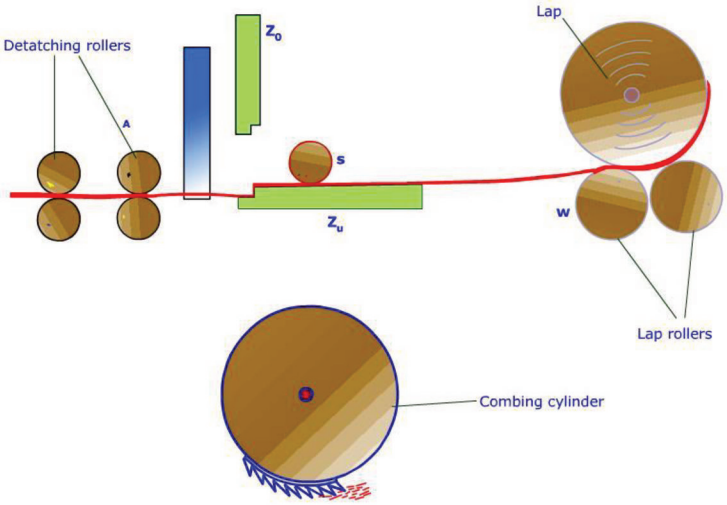


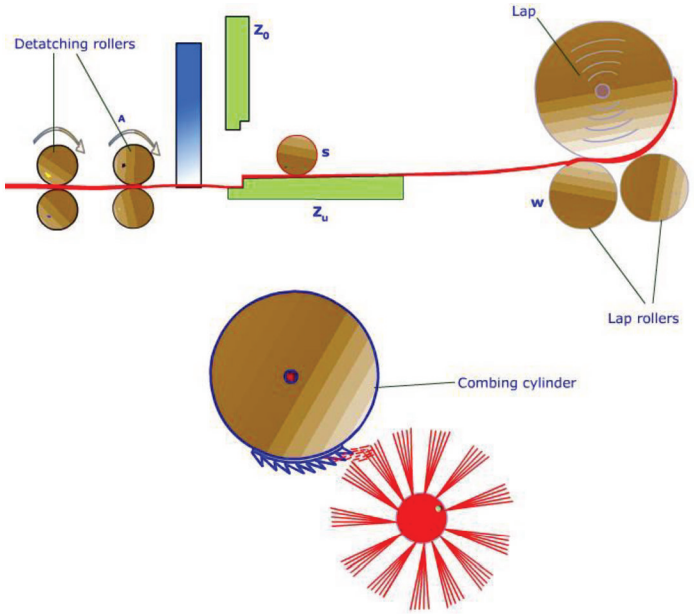
✓ **Piecing:** In the course of the forward movement of the nippers, the projecting fiber fringe **(B)** is placed on the returned web **(V)**



✓**Detaching:** The detaching rollers begin to rotate in the forward direction again and draw the clamped fibers out of web **(W)** held fast by feed rollers **(S)** (inside the nippers)

✓**The top comb:** Before the start of the detaching operation, top comb **(F)** has thrust its single row of teeth into the fiber fringe. As the fibers are pulled through the teeth of the top comb during detaching, the trailing part of the fringe is combed, thus making up for the inability of the circular combs to reach this part of the fringe





✓**Cylinder cleaning:** As the nipper assembly is retracted, the nippers will open for the next feeding step. During that time top comb will withdraw and the system is ready for new combing cycle

- Nipper assembly moves back.
- Top comb is withdrawn and new cycle begins.
- Combing segment is cleaned by the brush roller.

COMBER NOILS

❑The percentage waste extraction during combing depends on the short-fiber content of the raw material, the final end use of the yarn, and the economics with respect to the effect of material cost on yarn cost. There are, particularly for cotton, four degrees of combing.

✓**Scratch Combing,** where up to 5% noil is removed. This gives no great improvement in average yarn properties but has the benefit or reducing end breakage rates in spinning and winding.

✓**Half-combing,** which involves around 9% waste, resulting in reduced yarn irregularity and improved spinning performance

✓**Ordinary/Normal combing,** involving between 10 to 18% noil, which is necessary for spinning yarns in the finer end of the count range.

✓**Full combing,** resulting in greater than 18% noil. This often means double combing to obtain the highest quality yarns – 18% removed in the first combing and 7% in the second.

❑In short staple spinning, cotton fibre having stable lengths greater than about 27 mm are commonly combed and ; those greater than 30 mm are used for finer counts, also generally combed. Usually, 13 to 15% is considered sufficient to meet high- quality requirements. In worsted processing, the ratio of top and noil is called the tear and is often used as a measure of the degree of combing. With 60s quality wool, the noil extract can be around 4 to 8%. When tops are dyed, they are either gilled or recombed, followed by two additional gilling.

The Production Calculation

➢The production rate of a comber depends on the following parameters.

The total sliver feed mass per unit length.	**L grams**
Combing speed	n, nips per minute
Feed rate	f, mm per nip
Noil	W %
Running efficiency	E%
No. of heads	N_H

The production rate P_R (kg/h) is then given by:

$$P_R = (100\text{-}W)\,L.n.f.E.N_H.60 * 10\text{-}10$$