ANCILLARY MOTIONS (Tertiary motions)

These mechanisms are required for defect- free weaving operation and to stop the machine automatically when such a fault occurs. Without these, the process will continue, but there will be occurrence of faults due to warp breakage, weft breakage etc. the machine has to be stopped manually for attending these faults and a substantial length of defective fabric would be produced by that time.

It is designed to improve productivity and quality of woven fabrics.

These include:

- ✓ Stop motion (warp & weft stop motions)
- ✓ Warp protectors
- ✓ Bobbin changing mechanism
- ✓ Selvedge devices & cutters
- ✓ Temples

Warp Stop Motion:

Warp stop motion is designed to stop the loom in very short period of time when warp yarn breaks. To stop the machine even when a single warp breaks and to facilitate detection of broken end.

It prevents the occurrence of missing end.

If the breaking of warp thread is not detected immediately, then the loose thread will tend to become entangled round adjacent threads, which will cause more threads to break and possibly create a fault known as “float” in the fabric.

Irrespective of the type of stop motion used, it is necessary to support a thin strip of metal, known as drop wire, dropper or pin on each end as a sensing mechanism.

Drop wire is a sensor and used as an automatic stop motion during warp breakage.

The weight of drop wire depends on the tension and linear density of the warp.
Warp stop motion stop the loom when a drop wire fall as the result of end break. The broken end is repaired and handled by the operator.

Warp stop motions can be classified as:

1. Mechanical Warp stop motions
2. Electro mechanical Warp stop motions (available in KTSC)
3. Electric Warp stops motions.

1. **Electronic warp stop motion**

The electric warp stop motion consists of several number of contact bars mostly (4-8) depends on the loom width and the number of warp threads positioned parallel to one to the other.
Each contact bar consists of two conductor bar that is on outer U-shaped and an inner flat conductor bar with insulation between them.
All the inner & outer conductor bar of the contact bars positioned parallel to each other must be connected in parallel position to an electrical source. This is done by connecting part.

The connecting parts serve to conduct electricity to several contact bar an electrical warp stop motion serves to close on electric circuit in the events of warp thread breaking and their by stop weaving .
The electric circuit is closed by means of drop wire resting on the warp threads.
When warp threads breaks, the drop wire falls on to corresponding contact bar and electrically connect the two conductors bars of this contact bars and close an electric circuit and there by stop weaving machine.

Weft Stop Motions

It is designed to stop the loom in the event of any weft break or weft slough-off to prevent "crack" in the fabric.
To stop the loom when there is a weft break or the weft package replenishes on non-auto looms.
It prevent the occurrence of missing picks.

This motion enables to stop the loom immediately after a weft break or weft running out. In case the loom is allowed to run even after the weft breaks there will be no woven cloth except long threads of warp.

It can be classified as:

1. Side weft fork motion
2. Center weft fork motion
3. Electronic weft fork motion (available in KTSC)
    a. Piezo Electric
    b. Optical sensor

Piezo Electric Weft Stops Motion (available in KTSC)

Provided with (manufacture with) 8 eyelets, each eyelet provided with piezo electric crystals.
Piezo electric crystals have double quality/ characteristics:-

- Vibrate when electric charges are passes
- If they vibrate, they produce light electric charges.

No vibration - there is loom stoppage
Vibration – there is no loom stoppage
Other function of piezo electric weft stop motion

- ✓ They sense low tension
- ✓ They sense where the two weft is inserted to one eyelets
- ✓ If there is no tension, then there is no vibration.

In the case of rapier and projectile weaving machines, the mostly used device is provided with piezoelectric crystals. These crystals have a double quality: if an electric charge passes through them, they vibrate, or vice versa if they are made vibrate, they produce a light electric charge.

This second property is used for the weft insertion control. This device, if it detects a correctly inserted weft, produces a light electric charge. As this signal is too weak, it is first amplified and then controlled against a sample signal: if the signal corresponds, nothing happens.

Otherwise, the absence of the charge is interpreted as a broken weft and the weaving machine stops. At this point the automatic pick finding device enters into action and brings the machine back to the shed where the fault occurred. In this connection you must consider that, although the stop signal is given quite quickly, a certain technical time for stopping the loom is required. During this time, although the weft presenting device is standing, the loom moves forward with some strokes which are compensated recovering tension and space through the reverse running of the evener rollers.

Weft Accumulator

Weft accumulator is a device, which stores in advance of insertion, a length of weft and allows it to be withdrawn at high speed comparatively at a low tension.

Some of the advantages of using weft accumulator are:

i. Reduction in the average tension during weft insertion
ii. Fewer weft breakages and less weft wastage.
iii. Equalization of yarn tension caused by the diminishing diameter of the weft supply package.
iv. Yarn loops can no longer be formed from the supply package.
v. Equalization of uneven unwinding characteristics of different types of packages.
vi. Increase the efficiency of the weaving machine.

However, there will be abrasion on yarn surface due to guiding and tensioning mechanism. Moreover, longer stoppage time for mending a yarn breakage if the fault is between the supply package and the weft accumulator would be the other problem.

In general the yarn is generally withdrawn continuously from the supply package at a rate governed by the measuring drum. To allow from different widths of the fabric, the measuring drum used on the loom may be interchangeable. Alternatively, the period of time during which the weft is wound onto the drum may be adjustable.

The most commonly used methods of weft storage are:

i. Prince-Nissan method

ii. Savi method (available in KTSC)

The Savi method can be designed to have either rotating guide and stationary winding unit or rotating winding unit and stationary guides.

TEMPLES

Temple: Roller device on a loom that hold the cloth at a proper width to prevent it from being drawn in too much by the filling.

This motion holds the cloth firmly at the fell to assist the formation of a uniform width cloth. The temples are used to hold fast the width of the woven cloth as equal to as possible to the width of the warp. It may be made of wood or metal. Metal is useful for rugs.

Types of temples

- Ring Temple
- Roller Temple (available in KTSC)

Signal column (Indicator)

- ✓ Red lights indicate normal running of the machine,
- ✓ Green lights indicate weft breakage
- ✓ White lights indicate warp breakage
- ✓ Blue lights indicate machine interference

Selvedges

Selvedge: - is the border or edge of the fabric.
As the shuttle moves back and forth across the width of the shed, it weaves a self edge called a selvedge on each side of the fabric. The selvedge prevents the fabric from raveling. It is usually made more compact and stronger than the rest of the fabric by using more or heavier warp yarns or by using a stronger weave. The kind of selvedge depends upon the economy of production and the expected use of the fabric.

The main functions of selvedges are:

- ➢ It prevents the outside ends fraying from the body of the cloth.
- ➢ It provides strength to withstand the strains of weaving, which arises as the cloth contracts in width due to weft crimp and as a result of the stenter machine pulling during wet processing after weaving.
- ➢ It is used to line up one edge of the fabric upon the other layer in garment manufacturing, so that layers can be cut simultaneously & accurately.

Selvedges are always drawn-in on a separate harness.
The most common types of selvedges are:

1. Conventional selvedge (normal bound or hairpin)
2. Fringe selvedge

Fringe Selvedge
It is produced due to following reasons:

i. The yarn is severed at the center of a wide fabric that is cut at the loom so thst several narrow fabrics are produced side by side.
ii. The yarn is severed at both sides of the fabric in which the weft is cut after each pick length.
iii. The yarn is severed at one side of the fabric in which the weft is cut after every two picks.

To reinforce the fringe selvedge different types of selvedges like tuck-in, leno, stitched or binder (with dummy selvedge) are used.

a) Tuck-in selvedge (available in KTSC)
b) Leno selvedge (available in KTSC)
c) Twisted or helical selvedge
d) Stitched selvedge

a) Tuck-in selvedge

The weft that protrudes from the cloth for a distance of 1.5cm is trapped & held by a selvedge gripper.
A double acting cam unit situated underneath the temple activates a needle, which initially moves towards the back of the loom and makes a sideways sweep to penetrate the bottom warp sheet & pass through the warp shed formed for the next pick until it is in a position in front of the selvedge gripper outside the selvedge.

The selvedge gripper moves towards the front of the loom to place the thread into the hook of the leading tip of the tucking needle. The return movement of the needle next pulls the weft yarn from the selvedge gripper & places it in the warp shed. The needle finally returns to its starting position underneath the temple so that will be clear from the action of slay during beating-up.

b). Leno Selvedge

It is most successful selvedge in preventing fraying & providing the strength by twisting the outer side ends around one another. But the weft tails are made to point up & down alternatively by the crossing end so that the fringe does not appear neat. One of the simplest types, which requires only a chain.

The standard end is held in a fixed position by a loop & the crossing end passes through the eye of a heald on the back shaft & also through a ring mounted on the end of the chain, when the back heald is down, the chain is pulled round the standard end but on the other pick, when the heald is raised, the chain pulls the crossing end to the opposite side of the standard end.

Machine parts

Warp stop motion (rack & drop wire):- to control the warp yarn breakage.

Weft accumulator (weft feeder):- to store reserve weft yarns to facilitate weft picking. To supply yarn to weaving machine smoothly with proper tension.
Weft stop motion (electromagnetic weft brake unit) :- to control weft breakage.
Temple:- to keep the fabric stretched by applying a force along the filling direction.

Pick sequence control unit: - to control uniform weft pattern picks. Used to control weft yarn insertion sequentially.

Weft cutter:- to cut the weft yarn at the required length.

Weft finger (weft lifter):- to feed the weft yarn properly to the rapier.

Weft approach device: - to approach the weft yarn at the required position to rapier.

False selvedge maker:- to form false selvedge.

False selvedge:-to get proper fabric selvedge and facilitate fabric to weave.

Selvedge cutter:- to cut the false selvedge from the fabric selvedge at the required length.

False reed:- support to form false selvedge

Signal column:-used to indicate the machine stoppage by different causes.

Emergency stop:-to stop the machine immediately when it is necessary and also to start on the machine when it is needed working.

Different guider: - used to facilitate weaving actions in general.

Tension device:- to provide adequate tension to the weft yarn

Circuit board:- to control the machine(loom)

Button:- to make on & off the machine without the motor stop when it is necessary.

Fabric measurement unit (picks counter):-to record the woven fabric length by picks.

$$\text{Length (meter)} = \frac{\text{picksx10}}{\text{WD}} = \frac{\text{picksx10}}{\text{density}}$$

1 counter read when the main shaft rotates 1000 (1000rpm)

LOOM DRIVES AND CONTROL SYSTEMS

Method of Loom Drive

Looms are driven by one of the following two methods:

1. Individual drive (available in KTSC)
2. Group drive

Limitations of room and power arrangement are:

- Large transmission loss
- An extensive loss in production if a breakdown occurred in the main power generator.

Merits of individual motors for each loom are:

- ✓ Minimized power losses, especially; if one loom is stopped for a long period of time.
- ✓ Individual motor requires less space, which was usually within the confines of the machine.
- ✓ Shed condition were improved by reducing the dirt and danger associated with the heavy rotating shafts and belts.
- ✓ Improved condition of light and visibility.

1. Individual Drive System (Direct drive)

In this modern system each loom has its own electric motor and a starter. The motor may drive the loom through a belt or gears. Individual drive is used for automatic looms and unconventional looms. Now a day it is also used for non-automatic loom.

Direct drive – motion transmitted from motor to the main shaft or pulley.

Advantages of Individual drive system:

- There is considerably economy of power as power losses are less.
- In case of motor failure, only a particular loom remains idle and this does not affect the working of other machines.
- It gives a clear view of the shed and the working hazard being reduced. Cleanliness and lighting are also improved because of elimination of overhead shafts and long belts.
- Lay out of looms is very easy.
- Replacement of belt takes very little time as direct drive motor employs grooved pulleys and V belts.
- Save power
- No side way movement is required.

Disadvantages of Individual drive system:

- High initial cost
- High maintenance cost

2. Group Drive System (Indirect drive)

In this system, very powerful motor drives an overhead shaft (sometimes underground shaft) called main shaft, that runs from one end to other end of the loom shed. This main shaft drives the pulleys on the crank shaft of a loom through flat belts. For starting and stopping the loom, fast and loose pulleys are provided on the crankshaft.

Indirect drive – motion transmitted by side way movement.

Advantages of group drive system:

- Economical with respect to fixed charges and maintenance.
- Initial cost is very low.

Disadvantages of group drive system:

Group drive is obsolete now a day because of the following disadvantages:

- Shafts, pulleys, belts etc absorb greater power and efficiently is considerably low.
- In case of motor failure all machines become idle.
- It gives a clumsy appearance and there are greater chances of accidents.
- Cleanliness and lighting are badly affected by the presence of overhead shafts and main belts.
- Gives greater power cost for driving, because of power losses.
- Lay out is difficult.
- It needs high torque
- There is inertial movement

The Mechanisms of Loom Controls

The most commonly loom control systems are:

1) Starting handle

Here, pushing action is required in belt drive to transfer the belt from the loose pulley to fast pulley.
The starting handle was also required to release the brake in starting the loom and to reapply it in stopping the loom.
Alternatively in an indirect drive system, it is required to activate the clutch arrangement or give a sideways displacement to the driving wheel.

Modification to the starting handle system include a handle at each side of the loom, a bar extending across the full width of the loom from the starting or a connection to the handle from a point at the back of the loom.

When the starting handle is “on” the clutch engage and open brake band but when it is “off ” the clutch disengage & the brake closed.

2) Loom brake

The movement of the starting handle from the ‘on’ to the ‘off’ position cause a brake band to close round the flat perimeter of a wheel is mounted on the main shaft of the loom and is acting as a brake drum.
Efficiency of brake system depends on angle of lap of brake band, the coefficient of friction, and the condition of the two surfaces.
Braking system should allow the loom to be brought to rest at the desird position in order to allow a yarn break to be repaired.

3) Inching and Reversing

The assumption that the loom will always come to rest in the required position is quite unrealistic and frequently it is necessary to adjust the position of the stopped loom by releasing the brake and turning the hand wheel of the loom.

4) Push-button control

It is most reliable way of ensuring a quick and accurate start and a complete first pick. It will always bring the loom the rest in the same desirable position with the heald shafts approximately level.
The loom can be made to run forward at normal or possible slow speed to a predetermined position. The loom can be made to run in reverse to the back center position so that restarting will take place from the most desirable position. More ever, running in reverse can be continued for the longer period for the purpose of pick finding.

Fabric Quality Inspection

Shearing machine:- The process of change fabric roll form to pales form for easily processed of the next step.
Grey cloth checking machine:-The processes to give grade by identify the major defects.
Folding machine:-The processes of folding the gray fabric for the purpose of simplify the next process and easily transfer from one place to the next.

Inspection: Defined as activities such as Measuring, Examining, Testing, Gauging, one or more characteristics of a product or source comparing these with specific requirements to determine conformity.

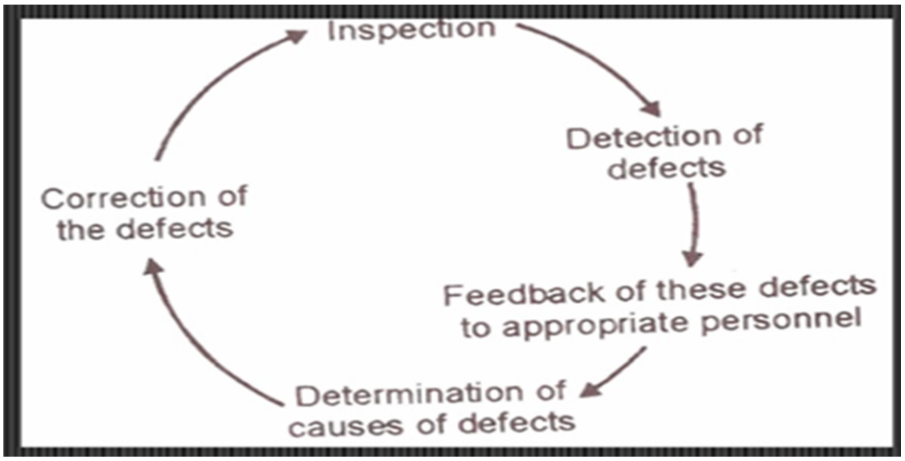
- ✓ Grey cloths from weaving have many faults (Broken ends and picks, stains and etc)
- ✓ Many of these faults can be corrected at grey stage before wet processing
- ✓ Also in grey inspection following points are checked
- ✓ EPI, PPI, Width and Length of fabric & GSM.

Fabric defect detection is a quality control process that aims at identifying and locating defect of fabric.

Principles

3c's of Inspection. Every Inspection Is Involving 3c's.

Check ⟹ Compare ⟹ Conclude



Inspection Instruments / Tools

The assessment may be carried out usually or by

- ✓ Pick glass
- ✓ UV lamp
- ✓ Visual
- ✓ Measurement by tape
- ✓ Streak analyzer
- ✓ Spotting with Shirley stain or similar staining agents

Types of Inspections

1. Point Based (available in KTSC)
2. Flow Based

1. Flow Based Fabric Inspection

- **Minor Faults**: 1 defects within 15 CM is considered as a minor faults.
- **Major Faults**: Within 15 CM More than 1 defects is considered as a Major Defects.
- **Selvedge Defects**: In case of furnishing fabric minor selvedge defects like pulled in selvedge are considered as major defects
- Small defects are nearer to the selvedge means, it will not considered to the serious problem

2. Point Based Fabric Inspection

There are three types of point based fabric inspection types:

1) 4 Point system
2) 10 Point system
3) Mil- Standards

But among them four point system is widely used.

i) **Four Point System**

In '4 Points' system of grading, faults are scored with penalty of 1, 2, 3 and 4 according to the size and significance.

Size of Defect	Penalty Points
Upto 3 inches	1
>3" to 6" inches	2
>6" to 9" inches	3
Above 9 inches	4

Maximum of 4 penalty points can be assigned for any single defect.
No linear yard / meter can be assigned more than 4 points regardless of number of defects within the yard/meter.
Employing the following criteria:
The defects in both wrap/weft, course/wale directions will be assigned points10.
The 4-Point System assigns 1, 2, 3 and 4 penalty points according to the size and significance of the defect.

- ✓ No more than 4 penalty points can be assigned for any single defect.
- ✓ Defect can be in either length or width direction, the system remains the same.
- ✓ Only major defects are considered.
- ✓ No penalty points are assigned to minor defects.

Calculation of total points per yards

In 4 point system fabric quality is evaluated by unit **points/100 sq. yds**.

Points / 100 sq. yd. = (Total points in roll * 36 * 100)/ (Fabric length in yards * Fabric width in inches)

Total defect points per 100 square yards of fabric are calculated and the acceptance criteria are generally not more than 40 penalty points. Fabric rolls containing more than 40 points are considered "seconds".

Normally fabric roll containing 40 points per 100 square yard are acceptable.

Example: A fabric roll 120 yards long and 46 inch wide contains following defects.

4 defects up to 3 inch length 3 defects from 3 to 6 inch length 2 defects from 6 to 9 inch length 1 defect over 9 inch length 1 hole over 1 inch	4 x 1 3 X 2 2 X 3 1 X 4 1 X 4	4 points 6 points 6 points 4 points 4 points
Total defect points		24 Points
Therefore, Points/ 100 sq. yards	= (24 X 3600)/(120 X 46) = 15.652 points	

ii) **<u>10 Point System</u>**

In '10 Points' system of grading, faults are scored with penalty of 1, 3, 5 and 10 according to the size and significance.

Size of Defect	Penalty Points
1 inches or less	1
Over 1" but not over 5"	3
Over 5" not over 10"	5
Over 10" / full width	10

<u>NB</u>: - Minor defects mostly mandible in inspection process.

If the number of major defects within 100 meters is 10 and below 10, it is considered as 1st grade fabric (dyed fabric) . If the number of major defects within 100 meters is between 10 up to 20, it is considered as 2nd grade fabric (printed fabric). But if it above 20 defect, it is given grade B.

Snap Study Techniques in the Loom Shed

Snap study is a technique that helps both in listing the various causes of loss in efficiency and in estimating the percentage loss due to each cause. For taking snap study, one walks down the loom alleys making the tally of looms that are stopped against a list of the causes of stoppage.

A loom should be marked running or stopped as the time of study. No looms must be omitted during the study. Once the round is started it must be completed without stopping in between.

1) Calculate the shed (loss) in efficiency by using snap study technique by taking round in 10-20 minutes interval.

	Causesforstoppage	**R**	**R**	**R**	**t**	**e**
1	Weaver attending					
	a) Warp break and warp fault					
	b) Weft break and weft fault					
2	Interference					
	a) Warp break and warp fault					
	b) Weft break and weft fault					
3	Non weaver					
	a) Breakdow maintenance and repair					
	b) Oilandcleai ng					
	c) Beam doffing and getting					
	d) Regular maintenance					
	e) Stylechange					
	f) Others					
Total						

Total number of looms in shed _____.