

PILLING AND ABRASION TESTING

Abrasion Resistance:

Abrasion is the rubbing away of the component fibres and yarns of the fabric.

Abrasion is of three types :

- ▶ Plain or flat abrasion - A flat area of material is abraded.
- ▶ Edge abrasion - Kind of abrasion which occurs at collars and folds.
- ▶ Flex abrasion - Rubbing is accompanied by flexing and bending.

FACTORS AFFECTING ABRASION RESISTANCE:

1. Fibre type:

High elongation, elastic recovery, and work of rupture are considered to be more important factors. (Nylon polymer) Blending of nylon or polyester with wool or cotton improves abrasion resistance.

2. Fibre properties:

Longer fibres incorporated into fabric confer better abrasion resistance, because they are harder to remove from yarn. For the same reason filament yarns are more abrasion resistant than staple yarns made from the same fibre. Increasing fibre diameter up to a limit improves abrasion resistance. Above the limit the increasing strains encountered in bending counteract any further advantage and also a decrease in the number of fibres in the cross-section lowers fibre cohesion.

3. Yarn twist:

Optimum twist increases the abrasion resistance. At low twist, fibres can come out and at high twist more abrasion due to stiffer yarn.

4. Fabric structure:

If one set of yarn is predominantly on the surface then this set will wear most. Relative mobility of floats helps to absorb the stress.

Factors affecting abrasion test result:

- ▶ **Type of abrasion:** Plane, flex or edge abrasion or combination.
- ▶ **Type of abradant:** standard fabric, steel plates, abrasive paper or stones selected based on actual use.
- ▶ **Pressure:** Higher pressure, more abrasion
- ▶ **Speed of abrasion:** A rise in temperature of sample can occur with high rubbing speeds, which can affect the fibre properties (thermoplastic fibres).
- ▶ **Tension:** At higher tension abrasion is more.
- ▶ **Direction:** In many fabrics abrasion resistance in the warp differs from that of the weft. Ideally the rubbing motion used by an machine should be such as to eliminate directional effects.

Method of Assessment:

- ✔ Abrade the sample until a predetermined end point, e.g. a hole and record the time on no. of cycles.
- ✔ Abrade for a set time or no. of cycles and then assess some aspects of the abraded fabric, e.g. change in appearances, loss of mass, change in thickness, loss of strength etc.

METHODS OF MEASUREMENT:

MARTINDALE ABRASION TESTER:

- ➔ Four specimens (38 mm diameter) are mounted in the specimen holder.
- ➔ The sample is abraded against standard abrasant under standard load.
- ➔ A complex motion (resultant of two s.h.m. at right angle to one another) is given to the specimen holder.

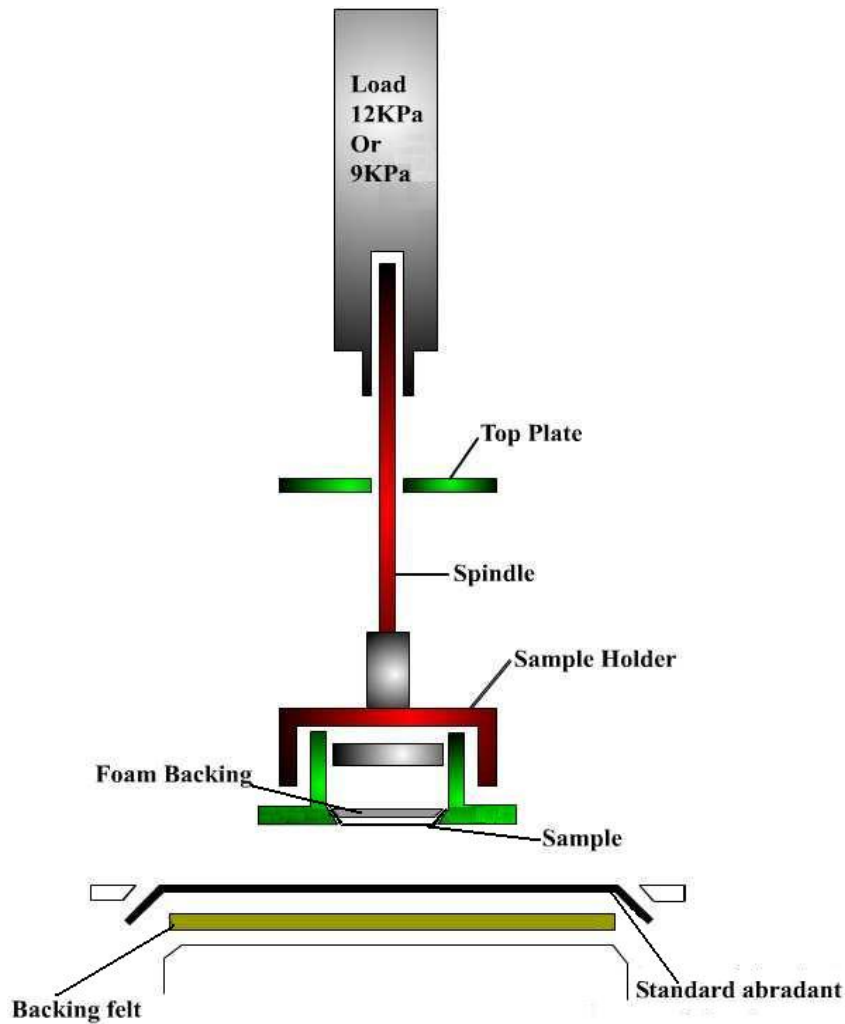


Figure: MARTINDALE ABRASION TESTER

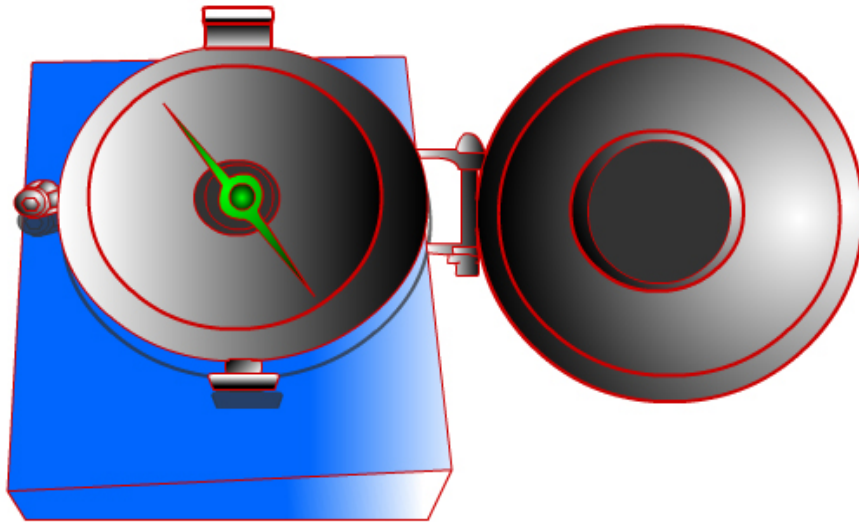
Assessment:

- ▶ No. of cycles are noted when two threads are broken. The specimen is examined at suitable intervals. If likely failure point is known, then first inspection can be made at 60% of that value.
- ▶ Average rate of loss is mass:
 - ▶ Total eight specimens, out of that two specimens abraded up to two thread break.
 - ▶ Other pairs are abraded upto 25%, 50%, and 75% of the above and average loss in weightt can be measured from a plot of loss in mass vs cycle (loss in mass in mg/1000 rubs).
- ▶ For hosiery fabrics, a flattened rubber ball is pushed through the sample as the holder is tightened thus stretching it. Tested at 12kpa pressure till hole appears.

Accelerator Abrasion Tester:

The fabric specimen is driven by rotor inside a circular chamber lined with an abrasive cloth.

- The sample suffers abrasion by rubbing against itself as well as the liner.
- Evaluation is made by (i) weight loss, (ii) loss in grab strength.
- Size of specimen depends on GSM, after abrasion the specimen is taken out and any loose debris are removed and then weighed % loss in weight is calculated.
- (ii) 100mm x 300mm specimen size.
- Folded 50mm from short edge and stitched to have 100mm x 100 mm specimen size.
- Folded edge is abraded.
- After abrasion the stitch is removed and the grab strength is measured.



The fabric specimen is driven by rotor inside a circular chamber lined with an abrasive cloth.

The sample suffers abrasion by rubbing against itself as well as the liner.

Evaluation is made by:

(i) Weight loss: Size of specimen depends on g/m^2 . After abrasion the specimen is taken out and any loose debris are removed and then weighed. % loss in weight is calculated.

(ii) Loss in grab strength:

- 100mm x 300mm specimen size.
- Cut in two pieces of 100mm x 150mm
- Folded 50mm from short edge and stitched to have
- 100 mm x 100 mm specimen size.