Colourfastness to rubbing is a basic test used by customers to determine the quality of a coloured fabric and has been an area of concern for processors for many years. The processor has to be aware of the required standards and relate them to the possible limitations of what can be achieved on the finished products.

It helps to understand the test itself, since there are few areas which are missed by in-house laboratories which may lead to differences in results.

This test is designed to determine the amount of colour transferred from the surface of coloured textile material to other surfaces by rubbing. It is applicable to textile made from all fibers in the form of yarn or fabric whether dyed, printed or otherwise coloured.

**Colour fastness to Rubbing – Standard test method.**

The following standard methods are generally employed to assess the rubbing fastness.

1. ISO 105 – X12 2002 : Colour fastness to rubbing
2. ISO 105-X16 : Colour fastness to rubbing - Small areas
3. AATCC 8:2005 : Colourfastness Crocking (AATCC Crockmeter Method)
4. AATCC 116-2005 : Colourfastness to Crocking (Rotary Vertical Crockmeter Method)
5. AATCC 165-1999 (Textile Floor Coverings – AATCC Crockmeter Method)

**Summary of the Methods**

Specimens of the textile are rubbed with a dry rubbing cloth and rubbing with a wet cloth. Two alternative sized rubbing fingers are specified, one for pile fabrics and one for other textiles. The staining of the rubbing cloths is assessed with the gray scale for staining.
TEST PROCEDURE IN BRIEF

APPARATUS AND MATERIALS

- Crockmeter, consisting of: A circular rubbing surface finger measuring 16mm in diameter exerting a downward force of 9N when moving back and forth along a straight line track of 100mm on the specimen.
- Cotton rubbing fabric: The rubbing fabric shall comply with ISO 105-F section F09 the fabric must not contain Fluorescent brighteners, Sizing material or any finish.
- Balance accurate to 0.01g.
- Grey Scales Staining.
- Colour Matching Cabinet.
- For Wet Rubbing only - Distilled /De-ionised Grade 3 Water (BS EN ISO 3696:1995).

TEST SPECIMEN

Testing is completed on fabric, typically in warp and weft directions separately. Most buyers’ requirements require that the worst of these is assessed and reported. For a solid dyed or printed fabric, differentiation in the two is not seen. However, when a striped / placement printed fabric, the staining is often different. It is important to note that a laboratory is expected to report the worst reading and not an average. This is due to the basic fact that laboratory testing is expected to bring out any possible areas of customer complaints.

For striped materials, the rubbing direction makes a lot of difference. Mark-off if rubbed along the stripe or across it could be very different. Buyers can have very different views of this test so a laboratory should follow all the requirements of the buyer. For example, in a striped fabric, some buyers often require rubbing to be done diagonally across the stripes.

In the case of yarn, this can be wound around a cardboard or knit into fabric before testing. The specimen size requirement is 140 x 50 mm.
TEST PROCEDURE

Dry Rubbing

- Use the holding clamp to mount the specimen on the baseboard of the Crockmeter. The long direction of the specimen is parallel to the track of rubbing. Ensure the specimen lays flat on the baseboard.

- Two tests are performed, one along the direction of the warp/length and the other of the weft/width.

- Mount a dry rubbing cloth flat over the end of the peg on the Crockmeter and hold it taut by means of the spring clip provided. Ensure that the rubbing cloth is not placed on the diagonal in the direction that the peg is moving.

- Rest the finger on the specimen, ensuring that the spring clip is not in contact with the test specimen.

- Rub the specimen back and forth over a straight track 100mm ± 8mm long for 10 complete cycles (i.e. 10 times back and forth) at a rate of 1 second for each cycle.

- It may be necessary to stretch some fabrics on to the base of the Crockmeter, to prevent the fabric from rucking up.

Wet Rubbing

- Wet out a rubbing cloth with distilled/deionised water to have about 100% pick up. A suitable method is as follows, however any method where the rubbing cloth picks up its own mass in water is acceptable.

- It is important to understand the quality of water used here. As per standards, Grade 3 water is a must.

- Weigh the dry rubbing cloth and then thoroughly wet out in distilled/de-ionised water, squeeze the wet rubbing cloth between blotting paper and re-weigh on the balance. Make adjustments as necessary by either blotting off more water or re-wetting.

- Use the following method to calculate 100% pick up of water - original weight of rubbing cloth x 2 (65% in AATCC method)

- Carry out the appropriate test as the procedure for dry rubbing.

- Allow the tested rubbing cloth to dry at room temperature.
EVALUATION OF RESULTS

- Eliminate the pulled out dyed fibres retained on the surface of the cotton rubbing cloth, using a piece of cellophane tape.

- Assess the specimens in a colour matching cabinet under D65, artificial daylight.

- In case of multi-colour fabrics, assess the grade of the most severely stained test area, or if possible, assess the grade of staining for each individual colour.

- Assess colour staining using the Grey scales for assessing staining and masks.

TEST RESULTS

- Are reported as numerical values between 1 and 5 with reference to the standard followed for dry and wet staining.

COLOURFASTNESS TO WET RUBBING AND SULPHUR BLACK

In the case of fabrics dyed using Sulphur Black, while Dry rubbing fastness ratings of 4 can be achieved, a technological limitation is that the wet rubbing fastness is never more than 1-2. This needs to be recognized by the processor, buyer and the trade. Sulphur Black is used for the deep black shade that it is able to impart to cellulosic fabrics and is often required to be used. However, the limitation on rubbing fastness should be understood before trade takes place else misunderstandings can result.

COLOURFASTNESS TO WET RUBBING BEING BETTER THAN DRY RUBBING

While it is true that in a vast majority of cases the Colourfastness to Wet Rubbing ratings are worse than Colourfastness to Dry Rubbing, this is not always the case. There are instances where the wet rubbing gives better results than dry rubbing.
This is sometimes observed in polyester fabrics. In these cases, the friction coefficient in wet crocking is lower than in dry crocking. Thus, in contrast to cotton, the colorfastness to wet crocking for polyester is higher than its colorfastness to dry crocking.

CASE STUDIES

Over the past many years we have come across many instances of claims and problems due to poor rubbing fastness properties. A few are given below –

Practical Case 1:

A Dutch Buyer of knitted pigment printed nightwear tested some samples of the received merchandise for rubbing fastness. They found the reports to be very poor whereas the Indian laboratory had passed the consignment. The Buyer took this issue up with the laboratory.

In the first instance, there were discussions regarding differences or errors in the testing procedure. An extensive laboratory testing correlation was undertaken and it was found that the variation was not in the testing procedure but within the garment itself.

The print on the face of the garment had a dry rub of 4 whereas the print on the back of the article had a dry rub of 2-3.

Reasons for such a variation were not clear, so this was investigated in detail. The garments were being printed and cured in garment form in a locally fabricated curing chamber. It was found that there was considerable temperature variation within this chamber. This led to uneven curing of the pigment print and thus varying colourfastness to rubbing properties over the same garment.

Modifications to the machine were undertaken, where air circulation was introduced and a few heaters were suitably relocated. In addition, loading procedures were changed to facilitate free flow of hot air in and around the garment. These ensured uniform curing. This was checked by colourfastness testing and cleared at the buyers’ end.

Practical Case 2:

A consignment of pigment dyed shirts sold very well in the UK. However, a customer returned his shirt to the store with a complaint that the colour marked off on his white leather car upholstery.

The defect had to be accepted by the store and the upholstery replaced at great cost. This was in turn deemed the responsibility of the manufacturer from India and a claim had to be paid.

This was a case where the colourfastness to rubbing was not tested at all and the Buyer had to implement a test protocol to avoid such errors.
Practical Case 3

A buyer rejected a consignment of yard-dyed striped shirts because of poor colourfastness to wet rubbing. Tests from the local laboratory consistently showed a fastness rating of 3 whereas the buyer reported a rating of 2.

After a lot of investigation, it was found that the buyer was testing the product by conducting the test along each stripe whereas the local laboratory tested across the stripe. This led to the difference in rubbing fastness results.