

# Pile Height and Terry Fabric - A Study

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**Abstract:** Home Textile includes towel fabric as one of the most important application. Quality of the towel fabric depends on the fabric absorbency. In towels, the terry towel is considered as famous method which gives thicker, more absorbent fabric. Apart from the material (yarn) used for towel manufacturing, quality of the towel will depend on pile height of the towel fabric. Various fabric properties are decided by the pile height.

**Key Words:** Towel, Terry, Pile Height, fabric thickness, absorbency, gsm

## 1. INTRODUCTION:

Out of the different ways of preparing towel fabric, fabric produced with loops is a popular way of towel fabric manufacturing. A terry towel is described as a textile product which is made with loop pile on one or both sides generally covering the entire surface or forming strips, checks, or other patterns (with end hems or fringes and side hems or selvages)

The terry fabric with loops can absorb large amounts of water. It can be manufactured mainly by weaving or knitting. Terry Towel fabric is woven on special looms that have two beams of longitudinal warp through which the filler or weft is fired laterally. The name "terry" comes from the French word "tirer" which means to pull out, referring to the pile loops which were pulled out by hand to make absorbent traditional Turkish toweling. Latin "vellus", meaning hair, has the derivation "velour", which is the toweling with cut loops. In research conducted on terry weaving by the Manchester Textile Institute, it was concluded that original terry weaving was likely the result of defective weaving. The research indicates that this development occurred in Turkey, probably in Bursa City, one of the major traditional textile centers in Turkey. Terry weaving construction is considered a later development in the evolution of woven fabrics. Terry toweling is still known as "Turk Fabric", "Turkish Toweling" or "Turkish Terry"

Soft and cozy, terrycloth is an absorbent fabric that is perfect for making towels, robes, cloth diapers, and soft toys. Surprisingly versatile, terrycloth can even be used for apparel like cute rompers, sundresses, loungewear, and active wear

### 1.1 Terry Cloth Manufacturing Process

The manufacturing process for terry cloth fabric uses a specialized weaving technique that employs a dobby loom and two warp beams: one for the ground warp and the other for the pile warp. The dobby raises or lowers sets of warp

threads, while the loom weaves the longitudinal, or filler, threads loosely between them. Finally, beating down the filler weave produces slack in the warp threads that forms the loops in the fabric.

In present study, fabrics with different pile height using cotton material are manufactured and properties of terry fabric are analyzed.

## 2. MATERIALS AND METHODS:

There are 2 beams used for producing the terry fabric. For ground 100% cotton yarn of 10s Ne OE (open end) and for pile 100% cotton yarn of 12s Ne RF (ring frame) are used. The weft of 100% cotton yarn 12s Ne OE (open end) is used.

Three terry fabrics with pile height of 3.5 mm, 4.2 mm, 4.6 mm are woven on Smith flexible rapier weaving machine having following parameters -

Machine details	Specifications
Machine Speed	240 rpm
Machine width	190 cm
Reed Space	66 cm
Type	flexible Rapier
Number of Heald shafts	8
No of beams	2

## 3. RESULTS AND DISCUSSIONS:

### 3.1 Pile Density:

Fabric samples of 1 x 1 inch size were cut and number of loop in the sample were counted physically.

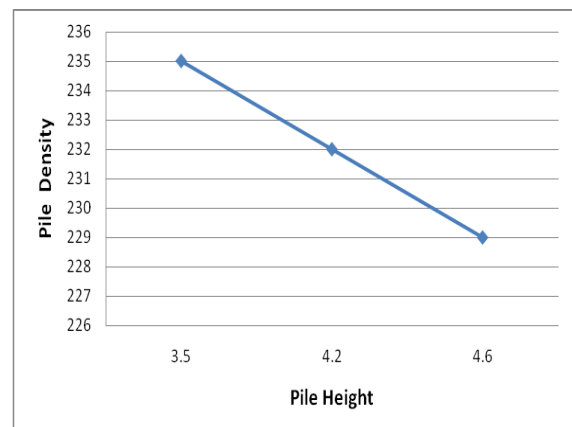


Fig. 3.1: Effect of Pile height on Pile Density

From above graph it is observed that, there is no significant change in the pile density with increase in pile height.

### 3.2 Fabric Thickness:

Pile height has effect on thickness of fabric and other related properties of the fabric. Test was carried according to standard ASTM D1777.

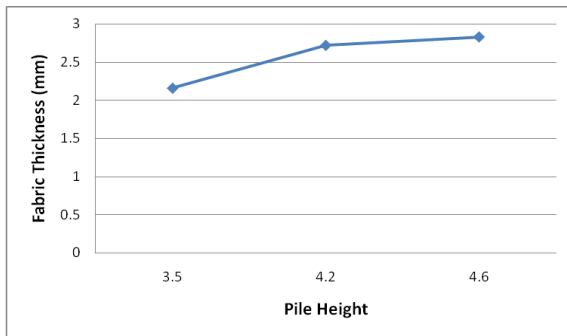


Fig.3.2: Effect of Pile Height on Fabric Thickness

From above figure it is observed that there is significant difference in thickness of the fabrics woven with different pile heights. There is gradual and significant increase in fabric thickness with increase in pile height. Loop size plays very important role on surface properties of terry fabric i.e. bulkiness of fabric.

### 3.3 Fabric GSM:

GSM of fabric was determined by cutting the fabric samples of 100 sq. cm by GSM cutter at five different places and weighed on electronic balance. The average of this was converted to get GSM.

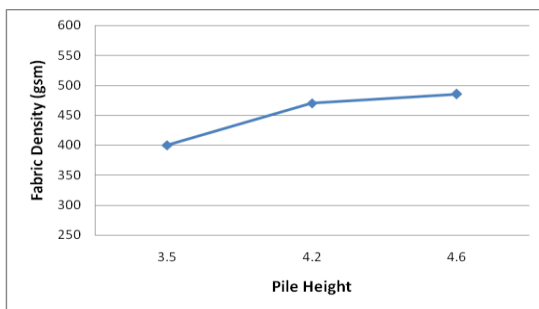


Fig.3.3: Effect of Pile Height on GSM

As observed earlier, as the pile height increases, there was significant increase in fabric GSM and this is due to increase in the length of yarn required to form the fabric.

### 3.4. Tensile strength:

Tensile strength testing was carried out to analyze strength of fabric for different pile height fabrics. Test has been carried according to ASTM D5035-95 standard.

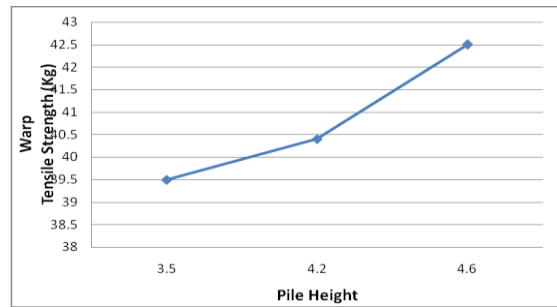


Fig.3.4a: Effect of pile height on warp Tensile Strength

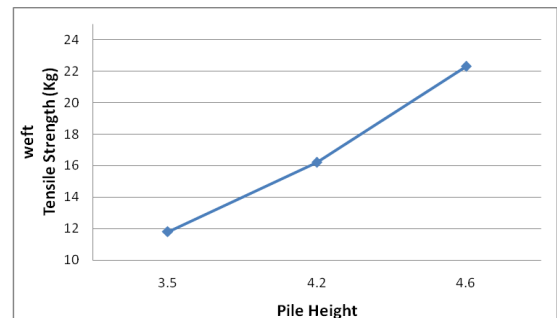


Fig.3.4b: Effect of Pile Height on weft tensile Strength

From above graphs it is observed that the tensile strength of warp is more than weft way. As the pile height increases, there will be more force required to straighten the yarn by removal of loops, and hence as the pile height increases there will increase in tensile strength and elongation of the fabric.

### 3.5. Air permeability:

Air permeability of the fabric was carried out as per ASTM D737 standards. The pile height has the effect on thickness of fabric and hence air permeability. Test result shown following trend

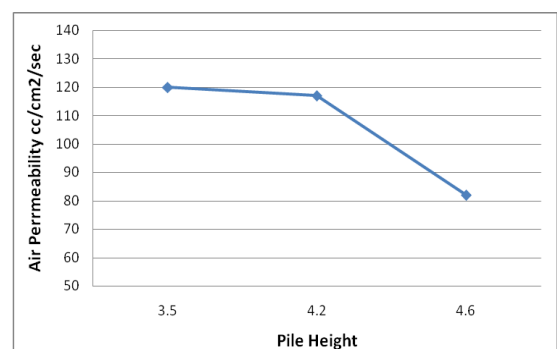


Fig.3.5:Effect of Pile Height on Fabric Air Permeability

From above graph it is observed that air permeability of the fabric is lower for higher pile height. As pile height increases the piles will fall on longer area and fabric will be more bulkier and air permeability decreases.

### 3.6. Fabric Absorbency:

Water absorbency of fabric was carried out by sinking time test. Test was carried according to ASTM D5725 standard. Sample of 1X1 was cut and weighted, sample was then placed in 100 ml distilled water and time was noted for fabric to touché the base of water vessel.

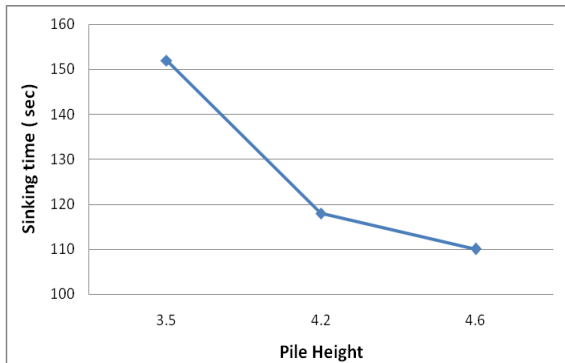


Fig.3.6: Effect of Pile Height on Water Absorbency

From above figure it can be observed that as pile height increases sinking time decreases. This was because in more pile height fabric the area available to absorb the water molecules was more so time required to absorb the water was less.

### 3.7 Moisture content:

Test has been carried according to ASTM D2495 standard.

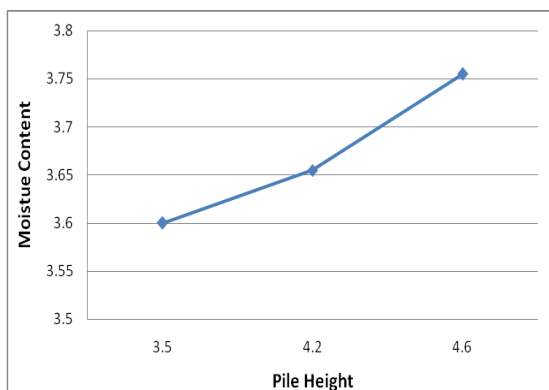


Fig.3.7: Effect of Pile Height on Moisture Content

From above graph, it is observed that moisture content in the fabric increases with increase in pile height. As the pile height increases, pile density increases, increasing the amount of yarn available per unit area and hence moisture absorption increases.

### CONCLUSION:

With increase in pile height, there is significant increase in pile density, GSM and thickness of fabric. Tensile properties have positive correlation with GSM and thickness. But comfort properties, weight and cost are also to be considered while designing the terry fabric parameters. Further studied can be concentrated by using yarns of

different natural origins or synthetic staple yarns of micro denier fibres.

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