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Spirality – Theory and Estimate

Introduction and Background

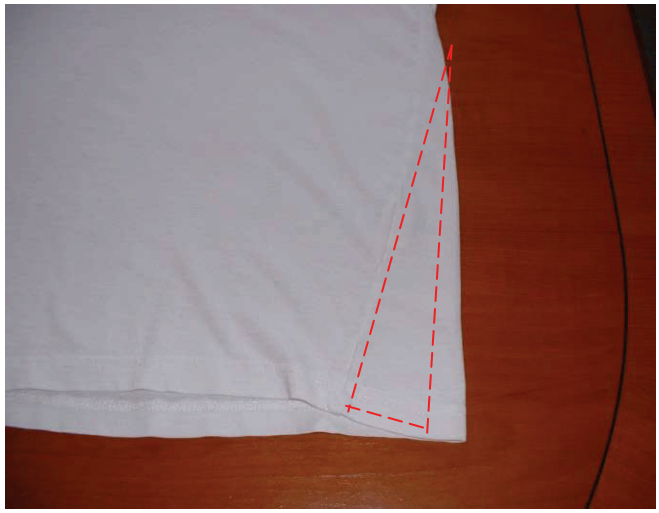
When knitting using a circular weft knitting machine, there is an inherent ***spirality*** as the courses are laid in a continuous helix around the machine. This means that the courses never form a perfect right angle with the wale line. This is unavoidable. The more feeders there are around a machine or conversely, the shorter the course length, the steeper the angle of the helix will be. As this is a feature of circular knitting, this is not considered to be a defect.

However, with some fabrics either as a result of high yarn twist, low tightness factor[1] or poor finishing or perhaps the influence of some other distortion, there is an inherent potential for fabric twisting, skewing or ***spirality***. If the angle of this distortion is small it is tolerable but if this becomes larger, it is cause for concern as the garment becomes unsightly and even uncomfortable to wear.

This distortion often develops as the cloth from which the garment is made relaxes as a result of wear or most commonly after washing (A recent Turkish study[2] finds that full relaxation occurs after 3 washes). The classic outcome of such relaxation is the twisting of the side seams so that they no longer lie straight down the sides but instead twist around the wearer's body so one seam is at the front and the other at the back (See Figure 1). In severe cases, this causes deformation of the garment panels and unsightly waviness of hemlines (See Figure 3) and bagginess in some areas and tightness in others.

Spirality is therefore a measure of quality of weft knitted fabric and whether expressed in mm, percentage, or angle, it should be minimal if the fabric is to be serviceable.

Figure 1



Calculation

For many years, the garment industry has used in-house methods to determine the potential for spirality in knitted fabrics either by measuring the fabric before making or by measuring the garment after making.

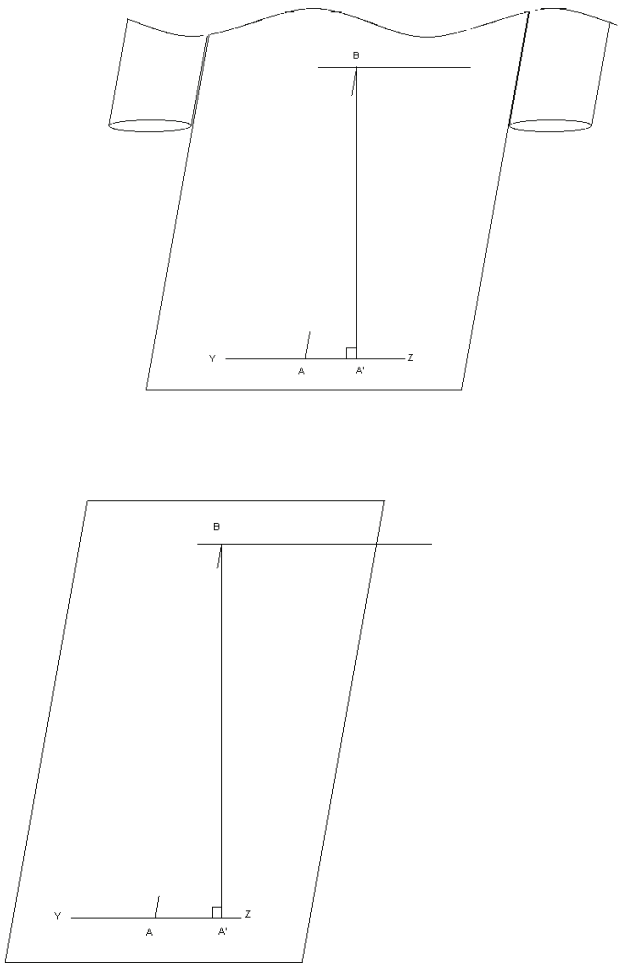
In June 2005, the International Standards Organisation (ISO) published a standard in 3 parts (clearly based on AATCC 179:1996 but not identical) to formalise a series of procedures for measuring this property.

ISO 16322 Part 2 tackles the assessment of spirality as a result of washing when measured in fabric form. Part 3 of the standard tackles the measurement of the property in garment form.

Part 1 calculates the percentage spirality from the angle subtended by the wales to the courses or more precisely the difference between the angle subtended (at A in Figure 2) and a right angle (90°)[3]. Thus if the courses are at 85° to the wales (instead of 90), then the spirality angle is seen as 90-85 = 5°, it then converts this angle to a percentage of 90°. This percentage is not comparable with the percentages calculated by the other two parts.

In Parts 2 and 3 of the standard, the spirality is calculated from triangles as shown below:

Figure 2



The diagrams in Figure 2 both show the specimen after washing, hence the lack of right angles at the corners.

The first is of a garment on which a horizontal base line and a perpendicular at its centre point to point B are drawn before washing. After washing, a new perpendicular is dropped from B to the base line at A' to make the third side of the triangle. The second diagram is of a flat fabric with a similar triangle drawn.

The spirality is calculated from the movement A A' as a percentage of either the length AB(Part 2) or A'B (Part 3). [AATCC 179 calculates from AB in all cases.]

Figure 3

The difference in lengths AB and A'B are small for small angles of spirality but may become significant with very large angles of spirality so care is needed to ensure the correct lengths are used in the calculations.

A similar calculation can be done using the side seams of a garment and the movement of the seam away from the perpendicular.

It is worth noting that when using the side seam method, the result can only be an approximation because of the distortion (See Figure 3) caused in the panels and the hemline by higher levels of spirality.

It is more precise to use the constructed triangles as shown in Figure 2. An example of wavy hemlines and distortion is shown in Figure 3.

Anyone using or interpreting these standards should be aware and very careful regarding spirality expressed in percentage as it may not mean quite what you thought it did!

When you need to be sure,
or you need to know more,
contact your local SGS office.

[1] Tightness Factor is a measure of the stitch density or cover factor of the fabric and is related to yarn linear density and stitch length.

[2] "The Spirality of the Single Jersey Fabrics and its effect on the Garments". F Ceken. Dokuz Eyul University Engineering Fac. Textile Eng. Dept. Bornova-Izmir/Turkey.

[3] The difference between the angle subtended at A and a right angle is equal to the angle subtended at B in the diagrams in Figure 2.

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