


Shrinkage and the Reference State

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Fabric Dimensions



The basic dimensional unit of a knitted fabric is the loop

The dimensions of any fabric are simply a reflection of the shape and size of the loops

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Shape and Size of Loops

Depends on:

- * Knitting variables
- * Type of wet process
- * Stretching during processing
- * Relaxation treatments

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Major Knitting Variables

Are:

- * Type of yarn
- * Count (size, number) of yarn
- * Stitch length
- * Size of knitting machine

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Type of Wet Processing

Wet processing affects:

- * Yarn weight
- * Yarn length
- * Yarn diameter and stiffness
- * Yarn twist liveliness

Amount of change depends on process type

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Stretching During Processing

Stretching the fabric affects:

- * Ratio of length to width
- * Weight per unit area
- * Shape of loops

Amount of change depends on process type

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Relaxation Treatments

Shrinkage is only the relaxation of processing strains

Therefore the fabric must be allowed to relax after wet processing

The most effective relaxation process is tumble drying

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Prediction of Shrinkage


If we want to control shrinkage then we must be able to predict it

In order to predict shrinkage, we have to be able to predict the dimensions that the fabric will have

AFTER THE SHRINKAGE TEST

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Shrinkage



The diagram shows a yellow rectangle representing the 'Original Dimensions' and a smaller green rectangle inside it representing the 'Relaxed Dimensions'. A vertical double-headed arrow indicates the height difference, and a horizontal double-headed arrow indicates the width difference.

Shrinkage Sample

Original Dimensions

Relaxed Dimensions

If we know the Relaxed Dimensions ...

... then we can calculate the Shrinkage

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What is the Real Shrinkage?

Shrinkage is not constant:

- * Different methods give different results
- * Customers use different methods
- * Different laboratories disagree

We need to know the *maximum level*

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Distortion

Distortion is why fabrics shrink

- * A manufacturer never sees an undistorted fabric
- * Neither does a retailer
- * Only the final consumer does

A rational system of fabric engineering and quality assurance ...

... needs a sound basis for making comparisons of distortion levels.

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Distortion and Shrinkage

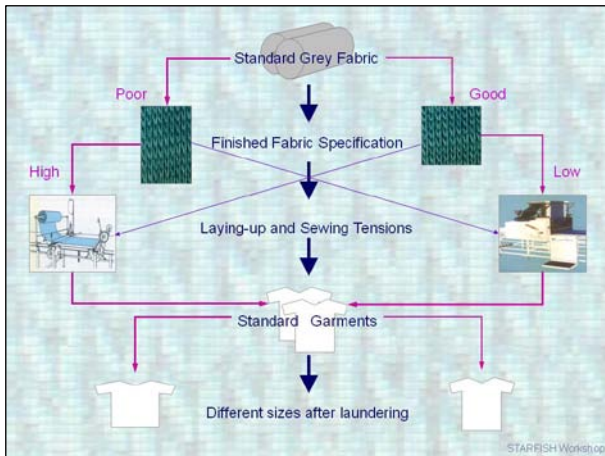
Shrinkage is OK for a pass/fail test but:

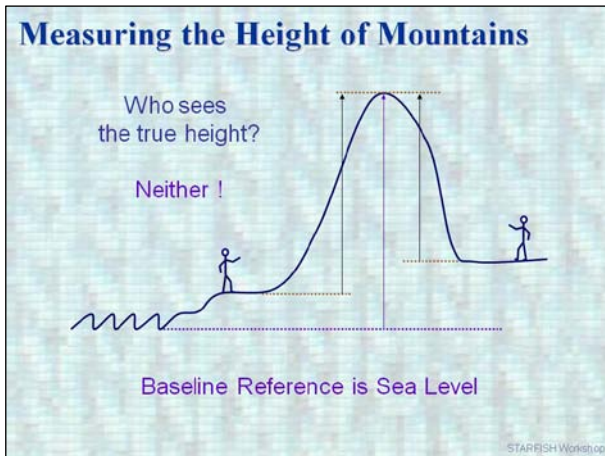
- > it is not very reliable
- > it is not very informative

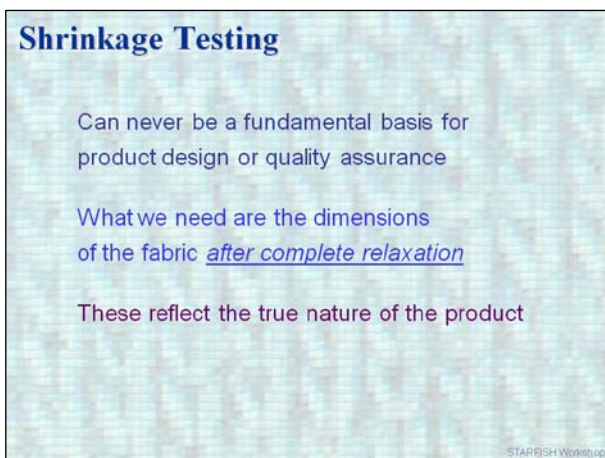
It does not distinguish between

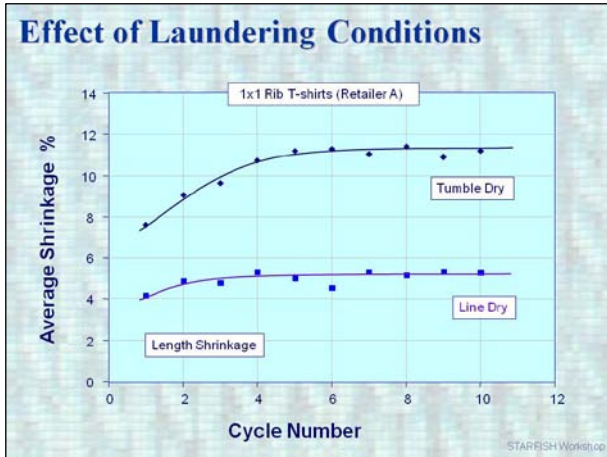
- > poor product design
- > poor manufacturing technique

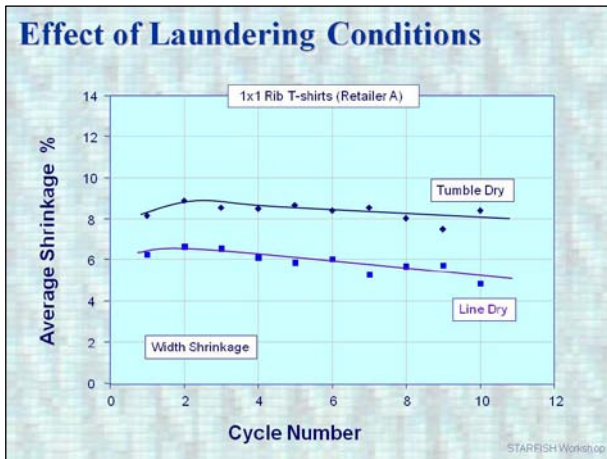
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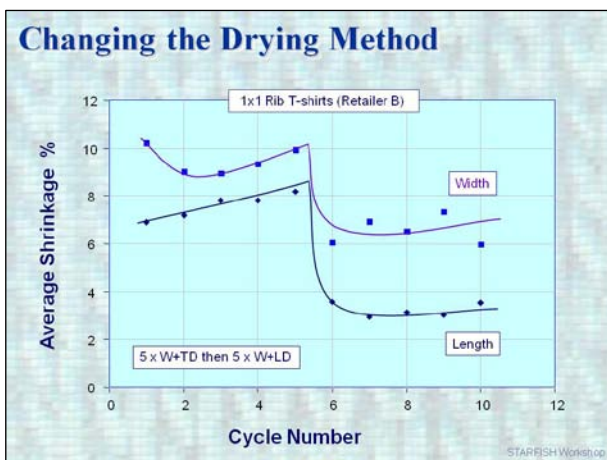


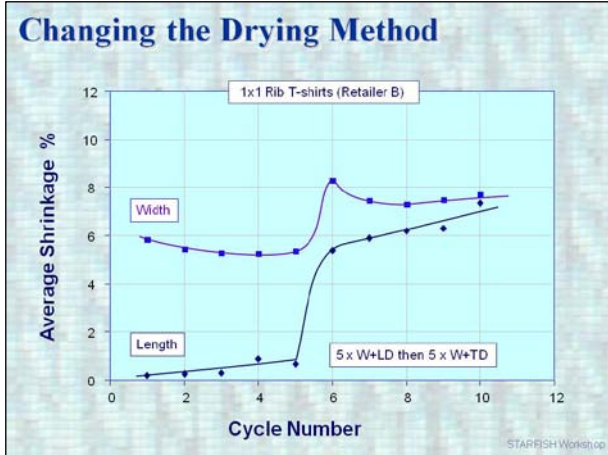


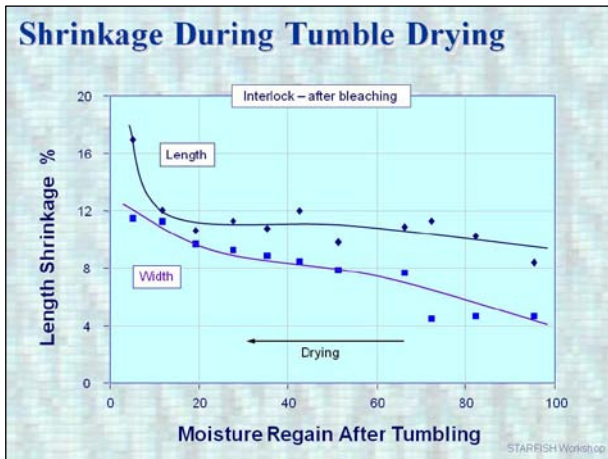


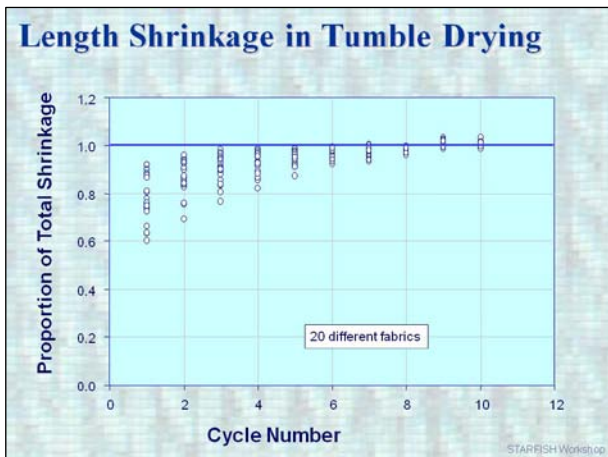












Laundering Conditions

Summary of research findings:

- * Tumble drying produces the relaxation
- * Samples must be thoroughly dry
- * Washing conditions not critical
- * Softeners increase variability

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Developing a Reference Method

Multiple cycles including tumble drying

- * Ten cycles best
- * Five cycles acceptable for research
- * Two/Three cycles OK for routine QC
- * One cycle not enough in any case

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1. Full wash programme at 60 °C
2. Tumble dry (completely dry)
3. Rewet on rinse cycle
4. Tumble dry (completely dry)
5. Repeat 3 + 4 three more times
6. Condition

Fabric is now in the "Reference State"

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STARFISH Reference State

Fundamental to STARFISH Technology

Foundation for the computer predictions

A basis for making valid comparisons

- For product development
- For process control
- For calibration

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