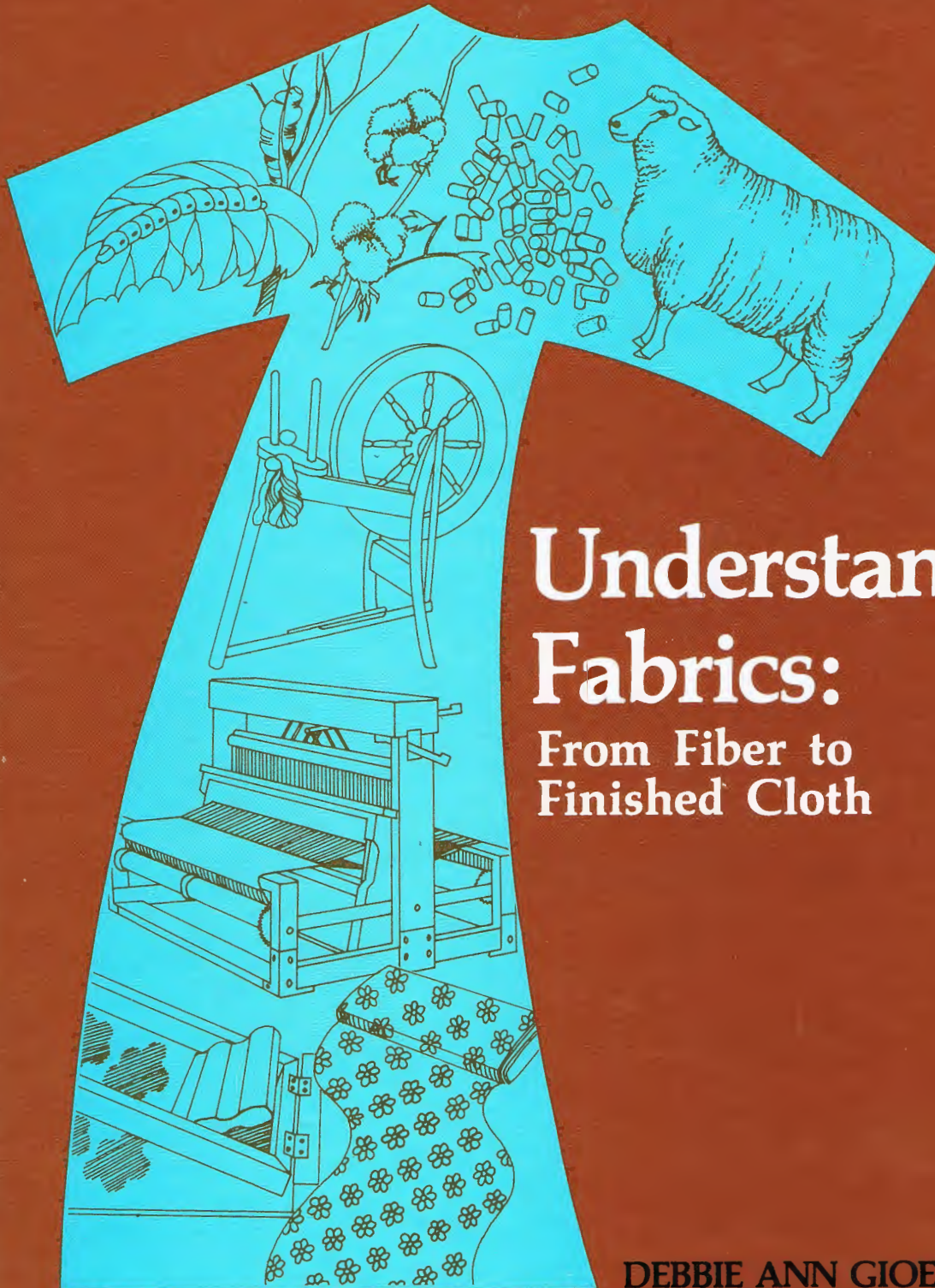


Language of Fashion Series



Understanding Fabrics: From Fiber to Finished Cloth

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Unless otherwise noted photography by author

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Knit Fabric Structure

Knit fabric structures are formed through the process of interlocking loops or forming loops with one or more yarns in preceding and succeeding rows. Knit fabrics are produced by hand or on a variety of knitting machines with one or more needles of different types.

Variations of knit fabrics may be achieved by adding, deleting or combining any one or more of the following:

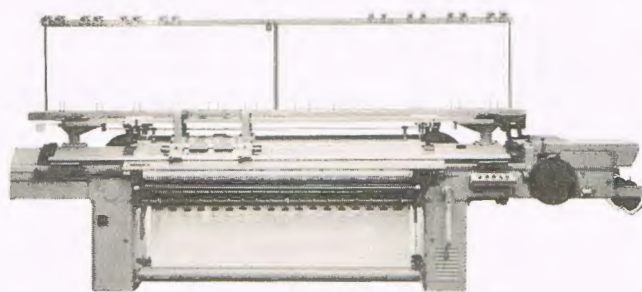
- Content of fiber—natural, man-made, blend or combination
- Type of fiber—filament or staple
- Size or denier of yarn—fine, lofted or bulked
- Type of yarn—twisted, textured, novelty or specialty
- Color of yarn—one color or multicolored
- Type and capability of knitting machines
- Attachments used on knitting machines
- Type and quality of needles
- Size, thickness and length of needles
- Formation of needles—inoperative or selectively operative
- Number and spacing of needle sets
- Size of stitches
- Formation and pattern of stitches
- Number or threading of guide bars
- Finishing processes applied to yarn and/or finished goods

Any variation of the above will affect the appearance, texture, performance expectation, weight, hand and drapability qualities of the fabric.

- Naturally inherent elasticity and/or resiliency
- Provides its own shape and drapability qualities
- Moves easily with body movements
- Stretch qualities not found in woven goods
- Insulating properties in still air
- Easy to care—requires little or no ironing
- Snags and pulls easily
- Poor crease retention because of loop formation
- Shrinks unless stabilized

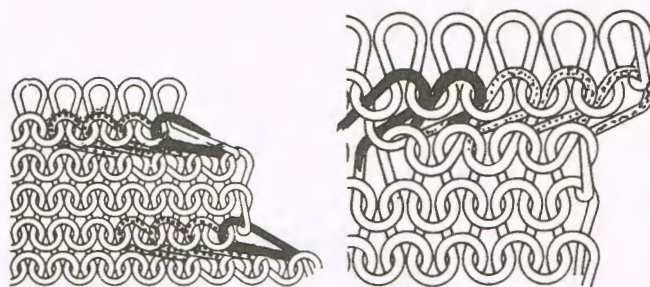
Knit fabrics are classified and named with regard to the:

- Structure of fabric
- Method or type of production or construction
- Type of machine used for its construction
- Number of guide bars on a machine



flat bed machine

University Knitting Machines Corp.



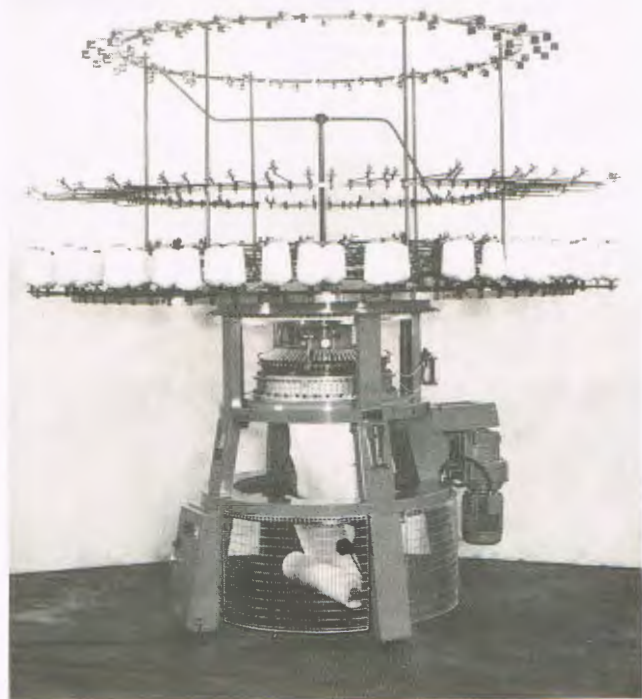
narrowing

widening



fashion marks

mock fashion marks



circular-type knitting machine

Milan Textile Machines Inc.

Types of Knit Fabric Structures

Flat Knit A flat-formed fabric or yard goods with straight edges or sides produced on a flat-bed machine.

Full-fashioned/Fashioned Knit A fully formed or partially shaped garment or garment component produced by increasing (widening) and/or decreasing (narrowing) the number of wales. The shaping operation is accomplished by controlling the movement of the needles. The needle action may tighten or loosen the stitch form; add or delete stitches; knit two or more stitches as one. Full-fashioned knits may be made on a flat-bed or circular machine.

1. **Widening.** Loops are transferred one at a time—from the center towards the end.
2. **Narrowing.** Four loops are moved across two wales each time—from the edge towards the center.
3. **Fashion marks.** Each time a needle transfers stitches in the widening or narrowing process to an adjacent needle it leaves a distinct mark in the fabric where it was widened or narrowed.

Mock Fashion Marks Artificial or mock fashion marks that may be machined or embossed into the garment at joining areas.

Tubular/Circular Knit A tubular or circular fabric produced on a circular-type knitting machine with the loop-stitch formation process made around the fabric. Needles on the knitting machine are arranged in a circle, producing fabric in tubular form. Goods may be produced as tubular yard goods or circular-shaped components or trimmings.



knitted stretch fabric structure



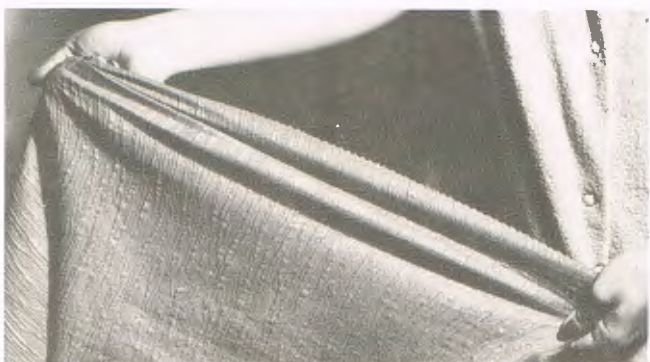
knitted stretch fabric
with elastomeric fibers



Helanca® nylon stretch yarn



back twisting stretch yarn



heat-set crinkle stretch finish

Stretch/Stretch Yarn Fabric Structure

A woven or knitted fabric constructed with specially prepared yarns or mechanically/chemically finished yarns to produce the characteristics of stretch and recovery to its original state on release from tension.

Stretch characteristics can be developed at the fiber, yarn or fabric structure stages.

- Increased comfort to the wearer
- Used for action and comfort stretch garments
- Used for well-fitted and attractive garments
- Improved and unrestricted form-fitting qualities to the body
- Greater and easier stretch
- Allow for greater and freer movement of the body
- Action and give needed when flexing elbows and knees
- Provide stretch across hips, shoulder, and seat of garments
- Higher elongation factor than any other fabric
- Extension and recovery for garment
- Shape retention and wrinkle resistant
- Wide range of designs

Types of fiber and/or yarns, finishes or structure used for stretch fabrics depend on the:

- Desired amount of elasticity
- Desired amount of power
- Yarns resemblance to other fibers
- Sheerness and hand of fiber, yarn or fabric
- Type of fabric structure
- End use of fabric
- Style and end use of garment

Amount of stretch and power or strength of stretch and recovery of the fabric depend on the types of fibers, the ply

and method of yarn process, the structure of the fabric, and the types and methods of finishes employed.

Stretch fabrics range from soft, pliable lightweights to firm, closely woven heavyweights with smooth, textured or pile surfaces.

Fibers for stretch fabrics include:

- Elastomeric fibers such as rubber or spandex
- Heat-set thermoplastic fibers with memory
- Modified version of filament fibers

Yarns for stretch fabrics include:

- Modified version of filament yarns
- Stretch, textured or high-bulked yarns
- Core-spun yarns with spandex or rubber core
- Conventional or false-twist-type yarns

Fabric Structures for stretch fabrics include:

- Knit fabrics made with elastomeric or core-spun yarns
- Most knit fabric structures with stretch in one or both directions (controlled by method or type of knitting process)
- Crepe fabrics made with high-twist yarns

Finishes for stretch fabrics include:

- Mechanical or chemical stretch
- Slack mercerization process
- Crinkle heat-set finish

Most fibers, natural or man-made, can be treated to produce a yarn with some degree of stretch and recovery. Variations of fibers and in methods of applying stretch properties will result in different built-in stretch and recovery properties.

When fabrics made with twist-textured yarns are stretched, the yarns extend; when fabrics relax, the yarns recoil to the heat-set shorter length.

Degree of stretch is referred to as the elongation factor of stretch fabrics. Stretch fabric elongation or degree of stretch may be measured as:

1. 5%-8% elongation—(woven fabric comfort stretch);
2. 400%-500% elongation—(Lycra® power stretch).

Stretch fabrics can be produced with:

- Horizontal stretch
- Vertical stretch
- Two-way stretch
- Power stretch
- Comfort stretch

Horizontal Stretch Stretch yarns are used as the filling yarns providing stretch in the crosswise direction, from selvage to selvage.

Vertical Stretch Stretch yarns are used as the warp yarns providing stretch in the lengthwise direction.

Two-Way Stretch Stretch yarns are used as both the filling and the warp yarns providing stretch in *all* directions.

Power Stretch

- With 10%-200% extensibility
- With spandex, lastril or rubber fibers and yarns
- Composed of heavy yarns
- For garments with holding power
- For garments with support and hold in body and muscles

Comfort Stretch

- With 15%-50% extensibility
- With textured nylon or polyester fibers and yarns
- Composed of core-spun spandex yarns
- May be made with regular yarns with special finishes
- Contain fine- to medium-sized yarns
- For garments with more give to body



Heat Sensitivity

Heat sensitivity is the chemical composition of a fiber, yarn or fabric in response to the application of heat. Man-made fabrics soften or melt at various temperatures. Cellulosic and protein fabrics scorch or turn brown under high temperatures.

Specific heat behavior of fibers, yarns or fabrics determines manner of handling during:

- Fabric structure
- Finishing processes
- Coloring or printing application
- Garment construction
- Care of garment (laundering and drycleaning)
- Selection of drying or pressing temperatures

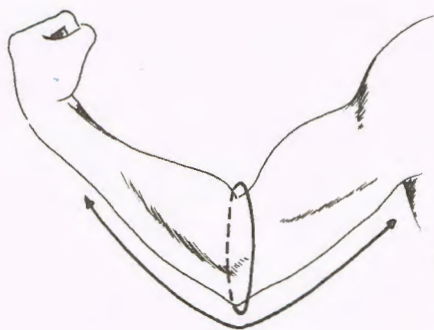
Thermoplasticity A term used to describe the properties of a fiber or a fabric to become *plastic* or to *soften* under heat and ability to *retain* a predetermined shape, size or design when cooled.

Thermoplastic fibers are heat sensitive. The control of heat causes physical changes of fibers which alter their forms, thereby establishing permanent shapes. Man-made thermoplastic fibers include: acetate, acrylic, anidex, modacrylic, nylon, olefin, polyester, rubber, saran, triacetate, vinyl, and vinyon.

Thermoplasticity allows for:

- Heat-setting of pleats and creases
- Molding shapes
- Dimensional stability/shrinkage control
- Low melting temperatures

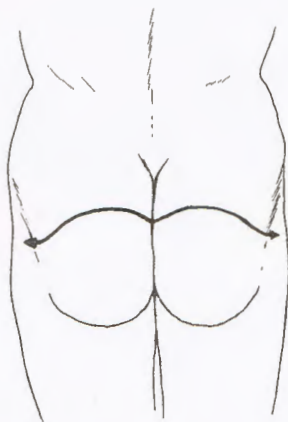
ELASTICITY OF TWO-WAY STRETCH ACTION FABRICS



elbow flex: vertical stretch (lengthwise) 35–40%; horizontal stretch (crosswise) 15–22%



knee flex: vertical stretch (lengthwise) 35–45%; horizontal stretch (crosswise) 12–14%



seat flex: horizontal stretch (crosswise) 4–6%

Elasticity/Elastic Recovery

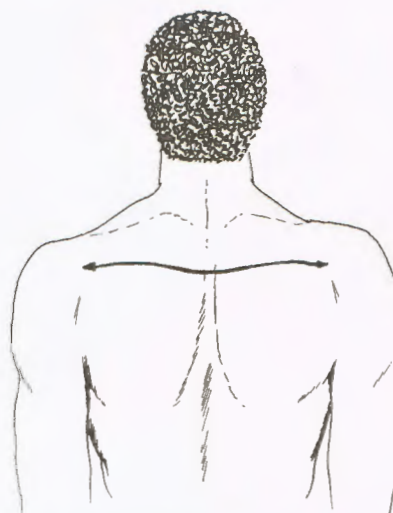
Elasticity is the characteristic of a fiber, yarn or fabric to increase in length under tension and to recover to its original length when released. The elasticity of a fiber is measured as the recovery at 2-percent elongation.

Elasticity of fibers vary due to the type, structure, shape and size that are inherent or manufactured. *Spandex* is highly elastic and recovers almost immediately on the release of stress. *Wool* and *silk* are considered relatively elastic. *Cotton*, *linen* and *jute* have only a small degree of elasticity.

There is an interdependency of fiber, yarn construction, fabric structure, and finishes to produce a fabric with good elasticity.

Fabrics with elasticity/elastic recovery:

- Produce comfortable garments
- Contribute to comfort and ease in body movements
- Contribute to shape of garment when worn
- Allow garments to be molded to the body contours
- Eliminate bagging at elbows, knees, and seat areas
- Prevent garments from becoming loose fitting with wear
- Reduce seam stress
- Increase breaking strength

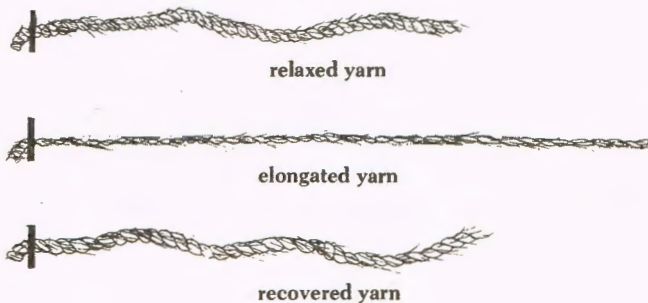


back flex: horizontal stretch (crosswise) 13–16%

Stretch & Recovery

Stretch and recovery refers to the property of a knit fabric when bonded to a tricot knit.

It is measured by the ability of the fabric to return *quickly* to its original position after stretching and being released from tension.



Elongation/Extensibility

Stretching, extending or lengthening a fiber, yarn or fabric under tension or stress up to a breaking point will determine its elongation or extensibility. The deformation or change in length is measured as a percentage of the original length of the fiber, yarn or fabric after application of tensile force. A minimum of 10 percent elongation in a fiber is desired. Stress beyond maximum elongation or extensibility capacity causes breakage of the fiber, yarn or fabric.

Elongation of fabric depends on:

- Type and content of fibers
- Configuration of yarns
- Fabric structure

Elongations vary at different temperatures and when fiber, yarn or fabric is wet or dry.

Crimped and textured yarns are used to produce fabrics with high elongation performance. The greater the yarn crimp, the more elongation/extensibility the fabric possesses.

Elongation in fabrics is necessary for:

- Strength
- Reduction of brittleness
- Comfort when garment is worn (the garment provides "give")
- Strength in seams
- Prevention of bagginess and sagginess at flex positions (elbows, knees, seat areas)