Finishes

FINISHES are processes performed on yarn and fabric or on weaving and knitting to improve the performance, look, or hand of textiles and clothing. Finishes are applied to fibers and fabric by a variety of physical and chemical treatments. The most appropriate finish for one item may not be the best for another item. This white-on-white fabric wall covering provides an example of an embossed finish.

Objectives:

1. Identify performance finishes.
2. Identify aesthetic finishes.

Key Terms:

acid-wash finishes
aesthetic finishes
antimicrobial finishes
antistatic finishes
calendering
chintz finishes
embossed finishes
fade-resistant finishes
finishes
flame-resistant and flame-retardant finishes
insect-bite-resistant finishes
irritation-resistant finishes
mercerization
moiré finishes
moisture-resistant finishes
moth-repellent finishes
nanotechnology
napping
odor-resistant finishes
peach-skin finish
performance finishes
permanent-press finishes
preshrunk fabric
Sanforized™ fabric
shrinkage-control finishes
sizing
soil-release and stain-resistant finishes
stonewash finishes
suede finishes
water-repellant finishes
waterproof finishes
weighting

Performance Finishes

Performance finishes are processes applied to alter the function or performance qualities of the base fabric. **Finishes** are processes performed on fiber, yarn, or fabric after weaving or knitting to improve the look, performance, or hand (feel) of the finished textile or clothing. The finishes may be wet, dry, cold, or heated. Generally, finishes are added in the yarn or fiber stage or after yarn has been woven or knitted. Finishes are applied to textiles and apparel chemically or physically. Consider the longevity of finishes when you purchase garments. Most finishes are categorized as durable (long-lasting during multiple cleanings) or nondurable (removed slowly through ongoing cleanings).

COMMON PERFORMANCE FINISHES

Examples of common performance finishes are antistatic finishes, permanent-press finishes, fade-resistant finishes, flame-resistant and flame-retardant finishes, mercerization, moth-repellant finishes, shrinkage-control finishes, soil-release and stain-resistant finishes, water-repellant finishes, and waterproof finishes.

Antistatic Finishes

Antistatic finishes are chemical inhibitors added during the manufacturing process of synthetic-fiber viscose solutions, or applied topically after fabric is manufactured, to diminish the buildup of dust and static electricity on the fabric surface. Antistatic finishes added to the viscose solutions are considered more durable than soluble finishes added topically. Antistatic finishes applied to wool and synthetic fabrics reduce static electricity by attracting moisture from the air to counteract dryness of the fabric. These finishes are applied on apparel, carpeting, and upholstery.

Permanent-Press Finishes

Permanent-press finishes (durable-press, crease-resistant, wash-and-wear, and wrinkle-free finishes) are care-free finishes designed to make natural-fabric care easier. Permanent-press finishes are applied to fabric by baking resins (formaldehyde) onto the fabric surface. The durable finishes last the lifetime of the fabric. However, the resins that enable manufacturers to permanently crease pants and pleat skirts have a downside. Resins weaken the fabric and make stains more difficult to remove.

Permanent-press finishes are used on cotton and blends of natural and synthetic fabrics. They are helpful in decreasing fabric wrinkling. When drying permanent-press garments, the dryer setting needs to be on “permanent press,” and garments must be removed immediately when the cycle ends. These steps assure that the finish remains most effective. Synthetic fabric is manufactured with permanent-press qualities (e.g., durable-press, crease-resistant, wash-and-wear, and wrinkle-free). As a result, synthetics by themselves do not need finishes to have these qualities.

Fade-Resistant Finishes

Fade-resistant finishes are treatments that prevent fabrics from fading during laundering, dry-cleaning, and exposure to sunlight. Chemicals are added to dyes and pigments to prevent fading and to cause the colors to remain "true" for long periods. Fade-resistant finishes are used on apparel fabrics, upholstery, drapery, and outdoor furniture fabrics.

FIGURE 1. Patio and poolside outdoor furniture fabrics and finishes—rattan, twill, and duck—must be fade resistant when exposed to sunlight.

Flame-Resistant and Flame-Retardant Finishes

Flame-resistant and flame-retardant finishes are treatments that inhibit the rate of ignition, slow the flame spread, and enhance a textile's ability to self-extinguish. These are topical applications and are heat-set into the textile. Chemicals are added to synthetic and natural fibers and fabrics during the manufacturing stage to make them flame resistant or flame retardant.

Flame-resistant finishes work by cutting off the oxygen supply, causing the flame to self-extinguish. Flame-resistant finishes are used in children's and firefighters' apparel. Cotton, rayon, and linen have the same chemical structure as paper, so to become flame-resistant fabrics, they need a special finish. This finish wears off after many launderings.

BROADENING AWARENESS...

AMAZING ASPECTS: Flame-Retardant Dangers

Flame resistant refers to a material's resistance to burning. Flame-retardant finish uses the toxic chemicals polybrominated diphenyl ethers (PBDEs), which are added to fabric to resist flames. There is considerable controversy about the value of chemical flame retardants. Retardants slow flames, but they will not prevent fire-related injuries. In addition, they make smoke more toxic. Some of those PBDEs are leaching out and building up in people. EPA senior toxicologist Linda Birbaum said, "They can affect the developing brain and can affect the developing reproductive system." They get into our food supply. In addition, they have been found in breast milk and in the air. Also, they have proven to impair thyroid function and cause damage to the nervous system.

PBDEs have been banned in Europe, and the United States is considering similar legislation. For the past 30 years, manufacturers have infused millions of pounds of brominated flame-retardant chemicals into computers, televisions, mobile phones, automotive and construction materials, mattresses, carpets, and upholstered furniture.

Mercerization

Mercerization is the application of caustic soda or lye to cotton or rayon to improve luster and absorbency, increase the affinity for dye absorption, reduce shrinkage, and make the fabric stronger. Immersion must last for less than four minutes before the fabric must be treated with water or acid to neutralize the caustic material.

Moth-Repellant Finishes

Moth-repellant finishes are topical chemical applications for wool or cellulosic fabrics to repel moths, carpet beetles, and other insects. These finishes may be durable or nondurable and can be renewed when wool is dry-cleaned. They can act as insecticides when the fibers have been altered to repel insects. Moth-repellant finishes are used primarily in apparel and carpet textiles.

Shrinkage-Control Finishes

Shrinkage-control finishes are a "preshrinking" of the fabric through the application of heat and moisture. A **preshrunk fabric** (as shown on the garment label) is a fabric that will not shrink more than 3 percent when cleaned or laundered. A **Sanforized™ fabric** is a fabric that will not shrink (or gain) more than 1 percent when cleaned or laundered. Shrinkage control is an important finish, as it controls the fit of the garments treated.

Soil-Release and Stain-Resistant Finishes

Soil-release and stain-resistant finishes are chemical treatments that hold dirt and oily stains on the surface of the textile long enough to be removed. They keep soil and stains from penetrating the finish. Fluorochemicals, silicone, and stain-blocker compounds cause soil to bead up and roll off the fabric, making it easy to wipe off. The finish boosts the ability of detergents to release soil from fabrics.

Treatments are applied during manufacturing or when fabric is sent to a finishing company. Topical applications from spray cans and those applied in a furniture warehouse are nondurable. Frequently, soil-release and stain-resistant finishes are used on tablecloths, carpets, upholstery, draperies,

FIGURE 2. This living room (decorated with drapery, valances, pillows, upholstery, lampshades, and carpeting) is an example of numerous finishes: fade-resistant, flame-retardant, mercerization, moth-resistant, shrinkage-control, stain-resistant, water-repellant, and antimicrobial.

window shades, and apparel. Some well-known repellant brands are 3M Scotchgard™ and DuPont Teflon®.

Water-Repellant Finishes

Water-repellant finishes are treatments that protect against water damage by making textiles less hydrophilic (water absorbing). Water-repellant finishes are applied by immersing fabric in wax, metallic soaps, or silicone baths. Water-repellant finishes cannot resist heavy or long exposure to rain. Finishes are not permanent, but they can be renewed by dry-cleaners. Water-repellant finishes are typically applied to tightly woven fabrics used for umbrellas, raincoats, outdoor furniture, draperies, and numerous nonresidential textiles.

Waterproof Finishes

Waterproof finishes are compounds that coat fabric and do not allow water to penetrate it. Waterproof finishes are permanent. They may stiffen in cold weather, and some fabrics become uncomfortable because they do not breathe. But membrane fabrics placed next to waterproof fabrics allow the passage of moisture vapor, making garments constructed in this way more comfortable. Waterproof fabric is used in apparel for fishers and firefighters.

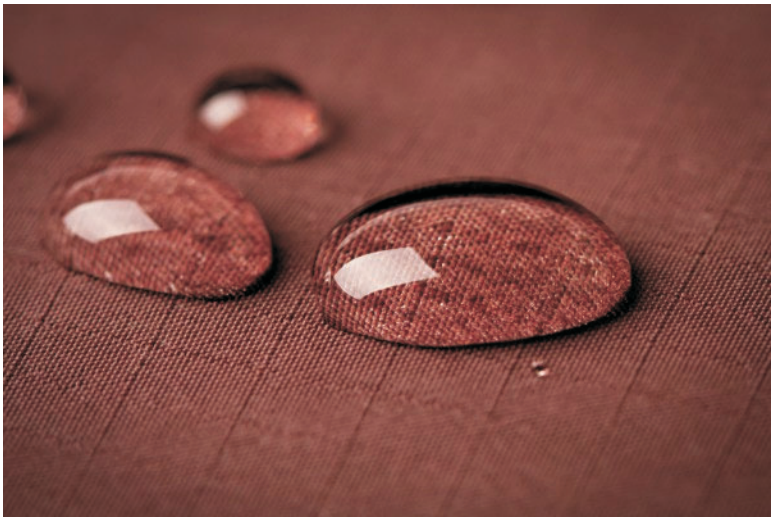

FIGURE 3. Waterproof fabrics are finished with a coating that sheds and does not absorb liquids. Waterproof fabric is commonly used in apparel for fishers and firefighters.

NANOTECHNOLOGY FINISHES

Nanotechnology is an altering of the molecular atom-to-atom structure of chemicals that, when used in the manufacture of fabrics, improve fabric performance. Nanosized molecules are attached to fibers during the fabric construction process. Nanotechnology adjusts heat and moisture in fabric to make clothing more comfortable in temperature and moisture situations. Nanotechnology has developed finishing applications to give surfaces antimicrobial, insect-bite-resistant, moisture-resistant, odor-resistant, and irritation-resistant properties, among others.

Antimicrobial Finishes

Antimicrobial finishes (antibacterial or antiseptic finishes) are bacteriostats, which are chemicals that suppress bacteria, mold, mildew, and odors; they slow or prevent the rotting

process. Antimicrobial finishes decrease the growth of microorganisms that can weaken fibers and cause staining and odors. Antimicrobial finishes inhibit the growth of mites (which can cause allergic reactions) in bedding. Antimicrobial agents can be applied to manufactured fibers before they are spun, and they can be applied as topical finishes to carpets and upholstery. Some antimicrobial finishes are applied to surfaces of carpets and materials in public places to achieve the controlled release of antibacterial properties on a continual basis.

Insect-Bite-Resistant Finishes

Insect-bite-resistant finishes are treatments that inhibit insect bites. Fabric is treated with chrysanthemum oil—a substance that resists ticks, mosquitoes, ants, flies, and chiggers. This finish is used on fabric designed for outdoor clothing worn by hunters, hikers, and forest rangers.

FIGURE 4. Insect-bite-resistant finishes inhibit bites from ticks, mosquitoes, ants, flies, and chiggers. Hikers and gardeners benefit from this nanotechnology finish.

Moisture-Resistant Finishes

Moisture-resistant finishes are treatments that keep the body comfortable by pulling moisture away from it, enabling the body to stay dry and cool or warm. In cold temperatures, fibers contract. In hot temperatures, fibers expand. Moisture-resistant finishes are used on synthetic and water-resistant fabrics (e.g., cotton duck, which is used for directors' chairs and outdoor furniture); canvas (outdoor marine fabrics used for boat covers and tarps); awning fabrics; and Phifertex® mesh (a durable open-weave, vinyl-encapsulated mesh construction similar to window screens). It is used for its self-draining properties for boat cushions and other outdoor applications. Moisture-resistant-finish Ripstop® is used for lightweight jackets and windbreakers.

FIGURE 5. Moisture-resistant finishes are used on synthetic and water-resistant fabrics, such as awning fabrics.

Odor-Resistant Finishes

Odor-resistant finishes are treatments that prevent odors in fabrics by preventing odor-causing bacteria, mold, and mildew from forming. These finishes are used on towels, socks, and hunters' clothing.

Irritation-Resistant Finishes

Irritation-resistant finishes are treatments that prevent fabric abrasion against the skin by embedding microcapsules in the fabric that break up and soothe the skin. For instance, aloe is used to moisturize socks. In addition, irritation-resistant finishes are used extensively in baby diapers.

Aesthetic Finishes

Aesthetic finishes are treatments that improve the luster, texture, drapability, or surface appearance of fabrics. They achieve a decorative result or an enhanced aesthetic hand or appearance. Some decorative finish effects enhance the surface by brightening or dulling its appearance. Aesthetic finishes can be permanent, durable, or temporary. They may damage or weaken the fabric.

CALENDERING

Calendering is subjecting fabric to a heavy roller that applies heat and pressure to change the appearance of the fabric. This process adds luster and smoothness to the fabric. Calendering effects are nondurable and can be destroyed by washing and wear. Finishes created by calendering are embossed, moiré, and chintz.

Embossed finishes are treatments that use engraved or bas-relief (raised) calender rollers to stamp 3D designs into fabric. Heat and pressure are used to imprint a raised or sunken pattern. Embossed finishes work best on soft fabrics.

Moiré finishes are a type of embossing in which the calender roller is raised just enough to create a watermark or a woodgrain design. A moiré effect is mainly

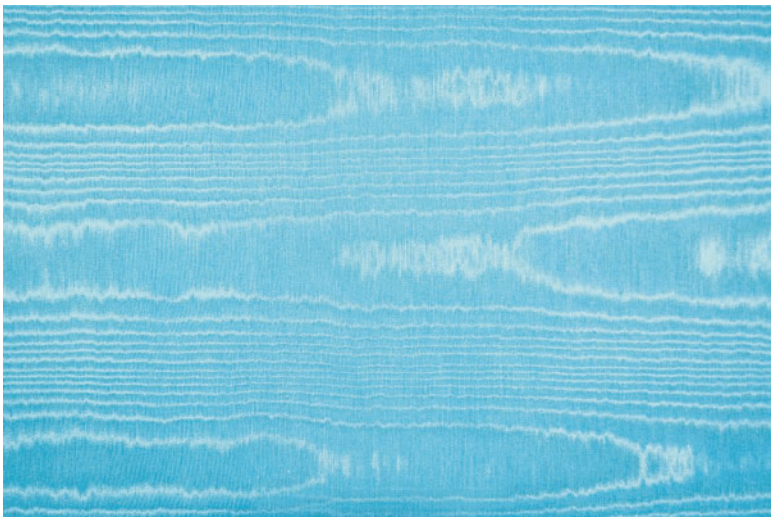

FIGURE 6. Moiré (pronounced *more-ay*) is a watermark or woodgrain finish created by calendering rollers. In this case, the moiré effect is used on satin fabric.

produced on silk, wool, cotton, and rayon. The fabric picks up a luster, resulting from the reflection of light on the surface.

Chintz finishes (or ciré finishes) are treatments that use a glaze (often in the form of a resin) that presses fabric through calendering rollers to create a polished (shiny) look. The finishes are often printed with flowers and other patterns in various colors.

NAPPING FINISHES

Napping (gigging and raising) is the result of pulling or brushing the ends of fibers to create a velvety, soft surface after the cloth is woven or knitted. In this process, the fabric is passed over rollers covered with wire bristles that lift the short fibers to form a nap. Fabric may be napped on one or both sides. Napping produces fleece-type, fuzzy fabrics and is used to make flannel apparel, baby clothes, and blankets.

SUEDE FINISHES

Suede finishes are treatments that actually "sand" the fabric by pulling up fibers as the fabric passes over rollers fitted with wires. The sanding of the fabric's surface creates a low pile. Suede finishes imitate leather suede but are less expensive. The most popular brand name with a suede finish is Ultrasuede™. Ultrasuede™ is a microfiber that has been sanded and has an extremely short pile known as **peach-skin finish**—a velvet-like finish for active wear, blankets, sweaters, coats, baby clothes, and sleepwear.

FIGURE 7. Synthetic brown fabric, often used in coats, is less expensive than genuine leather.

SIZING

Sizing is the addition of starch or resin to fabric to increase the fabric's weight, body, luster, and dirt resistance. Sizing fabric finish comes in aerosol cans and is applied to the fabric surface. A resin finish is preferred on natural fibers because starch finish wears out.

STONEWASH FINISHES

Stonewash finishes are treatments that create a worn look for new fabrics—usually denim—by washing the fabric with smooth rocks. The stonewash appearance was first popularized in the 1960s when fabric was placed in a clothes washer with pumice or river-rock stones and washed repeatedly to get the right effect. The stones beat against the fabric. This process, though very hard on the fabric, increases fabric softness and flexibility. Also, it produces a naturally worn and faded look. In the past decade, stonewash finishes have been created with enzymes. This new process saves on water and does not stress the fabric.

FIGURE 8. This is a stonewash finish.

ACID-WASH FINISHES

Acid-wash finishes are treatments that create a more worn look than stonewash finishes. The fabric, usually denim or canvas, is sprayed with a diluted solution of chorine bleach or a solution of potassium to create a sharper, splotchy contrast of color, ranging from indigo blue to white. The amount of chlorine bleach (NaClO), sodium hypochlorite 5.25, or potassium permanganate ($KMnO_4$) added to the fabric must be carefully controlled. Obviously too much of the acid chemical weakens the fabric fibers.

WEIGHTING

Weighting is the process of adding metallic salts to a silk fabric to increase the fabric's weight and crispness. Excessive metallic salts weaken the fabric. The U.S. Federal Trade Commission regulates the amount of metallic salts added to silk. Unlike other fabrics sold by the yard, silk is sold to the wholesaler by weight.

Summary:

Finishes enhance the durability, look, feel, and performance of textiles. Finishes may be applied wet, dry, cold, or heated. They can be added in the yarn or fiber stage or after the yarn has been woven or knitted. Synthetic fabrics may have properties added in their chemical formulas, but natural animal and plant fabrics often require that finishes be applied topically to their surfaces to make them antistatic, permanent press, fade resistant, moth repellent, and/or waterproof. Mercerization,

shrinkage-control, water-repellent, and sizing finishes are produced with chemical applications.

Nanotechnology improves fabric performance by altering the molecular atom-to-atom structure of chemicals used in fabric manufacturing. Nanotechnology has developed finishing applications to give surfaces antimicrobial, insect-bite-resistant, moisture-resistant, odor-resistant, and irritation-resistant properties.

Aesthetic finishes improve the luster, texture, drapability, and surface appearance of fabrics. Embossed, moiré, and chintz finishes produced by calendering are decorative finishes. Finishes such as napping, suede, sizing, stonewash, and acid-wash are created by mechanical or topical treatment. Also, weighting is a process that adds weight and crispness to silk, which is measured and sold by weight instead of by the yard.

Checking Your Knowledge:

1. List some finishes that enhance the capabilities of fabrics.
2. What is the difference between durable and nondurable finishes?
3. How are permanent-press finishes applied to fabric?
4. Why are Sanforized™ fabrics preferred?
5. What is the process used to create embossed, moiré, and chintz finishes?

Expanding Your Knowledge:

Do you like the stonewash look that first became popular in the 1960s? You can create your own denim stonewash finish at home. Go to http://www.ehow.com/how_8172009_stone-wash-denim.html for instructions.

Web Links:

Permanent Press

http://organicclothing.blogs.com/my_weblog/2009/01/permanent-press-facts-behind-the-fabrics.html

Special Finishes

http://www.creation-international.com/Presentations/Special%20Finishes%20of%20Textiles.PDF

Soil-Release Finish

http://www.fibre2fashion.com/industry-article/textile-industry-articles/soil-release-finish/soil-release-finish1.asp