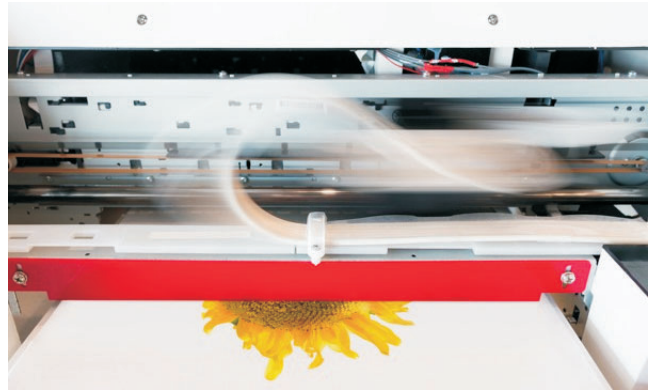


Textile Trends: Innovative Industrial Uses

TEXTILE TRENDS are found in virtually all industries today. Textiles have many functional purposes aside from aesthetic appeal, or how good a product looks. Technical textiles are typically manufactured for function: indoor-outdoor furniture, soundproofing and insulation, fabric buildings, shades and other protective structures, packing materials, roadway and embankment reinforcement, and crop and greenhouse coverings, as well as interiors and exteriors of automobiles, ships, and airplanes.



Objective:



Analyze innovative industrial textile trends.

Key Terms:



abrasion-resistance	flocking	plasma
absorbency	foiling	print
aesthetic appeal	Geotech	Protech
Agrotech	geotextiles	semipermanent finish
antibacterial	glossing	smart textiles
antiseptic	heat-resistant	Sporttech
biodegradable	Homotech	synthetic dye
Buildtech	Indutech	technical textile
Clothtech	inherently-flame-resistant	temporary finish
durability	Kevlar®	textile
dye	knit	trend
elasticity	Mobiltech	water-repellent
expanding ink	natural dye	water-resistant
finish	nonwoven	waterproof
flame-resistant	Packtech	wicking
flame-resistant-treated	permanent finish	woven
flame-retardant		

Trends in the Industrial Use of Textiles

SOME BASIC DEFINITIONS

A **textile** is a cloth-like fabric or material. A **trend** is an innovative approach that alters or progresses over time. Textile trends pertain to, but are not limited to, color, fabric, style, function, and innovative approaches.

A **knit** is a fabric created by inter-twining loops of one or more yarns. A **woven** is a fabric created by interlacing two or more threads by hand or by machine. A **nonwoven** is a fabric created by matting and pressing fibers together to intertwine those fibers and create a bond. Nonwoven fabrics can be made chemically, mechanically, or by a finish treatment, such as heat bonding.



FIGURE 1. This is a fabric display product of Fabric Images, Inc., at EuroShop, a world trade show where retailers meet trendsetting ideas. (Courtesy, Fabric Images, Inc., Elgin, IL)

TEXTILE TREND CATEGORIES

Buildtech

Buildtech is a textile trend category that focuses on architecture and the construction of buildings and other sound structures using technical textiles. A **technical textile** is a yarn or fabric engineered and manufactured to serve a specific purpose or function: building safety, structural protection, or aesthetic appeal. Traditional materials, such as aluminum, galvanized steel, and stainless steel, are now being replaced with textiles.

Building Safety and Structural Protection Uses

Heating and cooling—Textiles are replacing traditional insulation materials for heating and cooling ducts (e.g., KE Fibertec HVAC systems insulation).

Roofing—Woven glass filaments or polyester fiber textiles are replacing traditional materials, such as sheet metal, clay, and slate.

Acoustics—Technical textiles are used to prevent noise and to soundproof floors, walls, and doors in sports facilities and sound studios. Materials include vinyl wall, ceiling, and floor tiles and vinyl doors. Also, other sound absorption materials, such as acoustic panels and other noise barriers, are used as vibration-control textiles for railways and subway systems.

Shelter—Technical textiles (including numerous types of plastic sheeting) provide temporary or permanent shelter from the elements—wind, sun, and other climatic factors—through their use in fabric buildings, tents, and tarps.

Highways and walkways—Technical textiles (e.g., rebar and wire mesh) are used to reinforce concrete sidewalks and streets to prevent cracks.

Interiors—Technical textiles are used in many interior constructions, especially wall, floor, and window coverings, acoustic ceiling tiles and soundproofing fabrics, and vinyl-clad door and window frames. They include both animal and plant materials.

Aesthetic Appeal

Architectural textiles add aesthetic appeal to functional products. **Aesthetic appeal** is the beauty of an object, form, or construction.

Skyscrapers, airports, and stadiums are adding Teflon®-coated glass or fabric roofs. Teflon® is a type of polytetrafluoroethylene (PTFE). The Georgia Dome has a Teflon®-coated roof, and London's Millennium Dome uses Beta Cloth, a fabric woven with glass filament fibers especially for roofing and for fabric shades (outdoor and indoor).

Sports stadiums and arenas, as well as hotels, are adding textile fabrics, especially silicone-coated polyethersulphone (PES) types, to seating and to wall, floor, and ceiling coverings.



FIGURE 2. The Revel Hotel and Casino's interior lounge uses many types of technical textiles. What technical textiles are visible in this image? (Courtesy, Fabric Images, Inc., Elgin, IL)

Clothtech

Clothtech is a textile trend category that focuses on innovations in textiles used for clothing.

Performance Uses

Antimicrobial finishes include antibacterial and antiseptic. **Antibacterial** is a textile characteristic in which the fabric or the fiber is treated to destroy or inhibit the growth of bacteria. **Antiseptic** is a textile characteristic in which the fabric or the fiber is treated to prevent the growth of bacteria.

Flame-resistant is a functional textile finish in which the fabric or the fiber is nonflammable or will self-extinguish. There are two flame-resistant techniques: **inherently-flame-resistant** is a process in which a flame-retardant chemical is embedded in the yarn, and

flame-resistant-treated is a process in which a flame-retardant chemical is applied after the fabric has been woven or knitted. **Flame-retardant** is a functional textile finish in which the threads do not meet fire codes but are topically treated with a flame-retardant chemical so that the end product meets fire codes. Once treated, the fabric has a slow burn rate or self-extinguishes.

Moisture management functional finishes include water-resistant, water-repellent, and waterproof. **Water-resistant** is a textile finish in which water penetrates to a small degree but not entirely; it is not waterproof. Most water-resistant fabrics are nylon or polyester varieties. **Water-repellent** is a textile finish that involves a synthetic resin, wax, oil, or metallic coating being sprayed on (or the fabric being immersed in the resin) to make water and mud slide off—the hydrophobic effect. **Waterproof** is a textile characteristic that makes the fabric impervious to liquids (watertight) via a rubber or plasticized synthetic resin that is then vulcanized or baked to prevent water absorption.

Durability is a textile characteristic that indicates long-lasting wear or wear that is consistent with the expected life of the garment or product. A semi-durable finish loses effectiveness after repeated laundering or cleaning and must be reapplied. A nondurable finish, such as starch, loses effectiveness after a single laundering or cleaning and must be reapplied.

Abrasion-resistance is the ability of a textile to resist surface wear and withstand repeated friction. For example, tarps, cotton canvas, Ballistic Nylon™, stiff nylon mesh for luggage and hunting, and Kevlar® for military use are considered abrasion-resistant fabrics.

Absorbency is a measure of how much moisture a fabric can capture and hold and the ease with which that moisture is picked up. **Wicking** is the action of moisture traveling along the length of a fiber but not being absorbed by the fabric. Moisture-wicking fabric is often used, for example, for workout clothing and sportswear; the fabric draws perspiration off the skin to the outside of the fabric, where it can evaporate.

Elasticity is a textile characteristic in which the fabric, the fiber, or both are able to spring back to original form.

Aesthetic Appeal

Dye is a natural or synthetic color or pigment added to change an original appearance. **Natural dye** is a colorant derived from plants, minerals, or animal sources. **Synthetic dye** is a chemical colorant derived from coal tar and/or petroleum.

Print is the application of colors, patterns, or designs as a decorative finish.

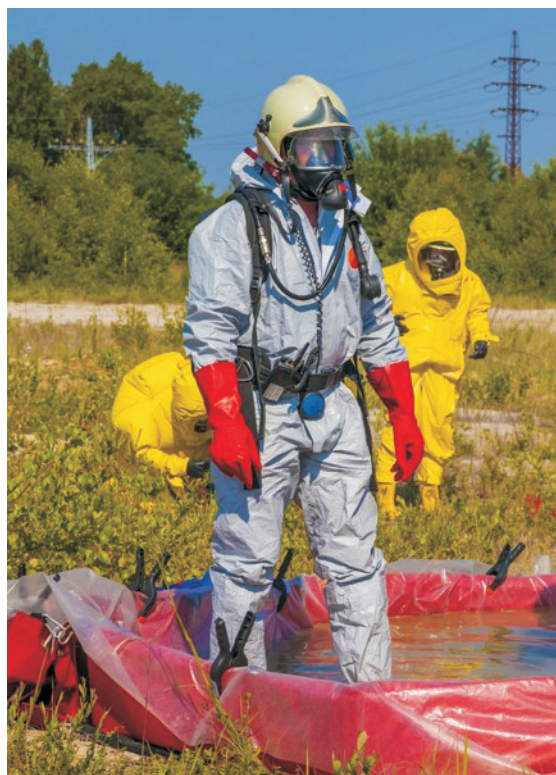


FIGURE 3. HazMat team members wear protective suits to guard against exposure to hazardous materials. The suits are PPE (personal protective equipment).

Finish is the improvement of appearance, texture, wear, or feel of fabric. Finishes are categorized based on:

- ◆ Durability
- ◆ Application method—thermal (e.g., permanent pleats), chemical (e.g., permanent press), or mechanical (e.g., flannel fabric nap)
- ◆ Purpose—routine, aesthetic, or functional

A **temporary finish** is a finish that washes out or dissolves after the first wash but can be reapplied as needed. As mentioned earlier, starch is a temporary finish. A **semipermanent finish** is a finish that remains on the fabric surface for multiple washings and eventually disappears, fades, or dissolves. A **permanent finish** is a finish that lasts for the life of the fabric.

Agrotech

Agrotech is a textile trend category that focuses on the use of technical textiles in agriculture, primarily for growth, protection, storage, and fertilization.

Uses

Safe and sanitary clothing—Farmers wear protective clothing when spraying crops with pesticides. Food handlers wear protective clothing, including hair nets, beard guards, and gloves.

Food storage—Fabric silos are replacing metal and concrete varieties, and finishes are used to prevent dirt and moisture from penetrating the structural fabric.

Plant coverings—Nonwoven fabrics are used for weed control, and fabric coverings are used for protection from frost.

Filtration equipment—Woven and nonwoven fabrics are used to prevent damage to soil and crops by draining standing water or filtering out minerals, salts, and other harmful substances.

Eco-friendly fabrics—Fabrics, such as burlap and recycled plastics, are biodegradable and are easily broken down for mulch or fertilizer. **Biodegradable** is the ability to break down into organic parts.

Greenhouse coverings and nets—Fabrics made from knitted recycled plastics and/or polyester can be used to guard plants against insects, pests, and rodents. They can also be used to protect

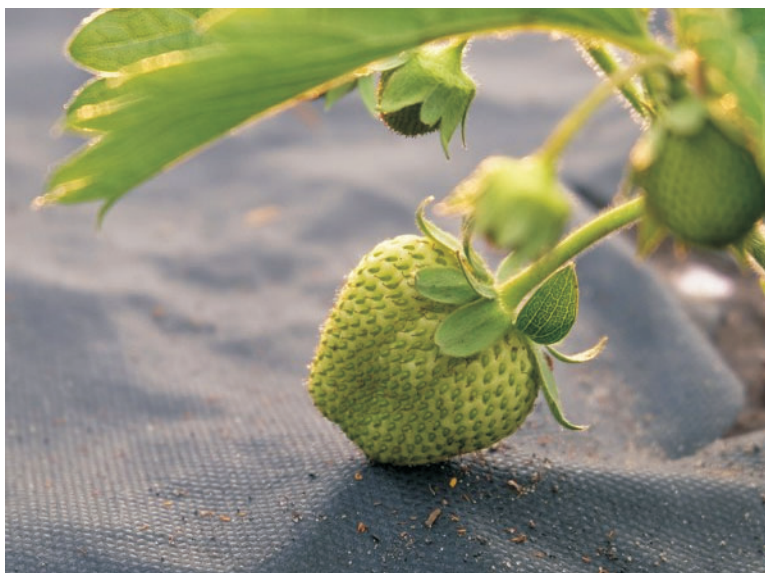


FIGURE 4. What use of an agricultural textile is shown here?

plants from heavy rains and frosts and to keep livestock off wet soil. Reflective fabrics are used to provide appropriate lighting to plants and other foliage.

Sun and wind screens—Knitted fabrics made from recycled plastics and nylon are used to protect humans, animals, and plants by deflecting sun, wind, ice, and snow.

Geotech

Geotech is a textile trend category that focuses on technical textiles that use a combination of woven and nonwoven fabrics in landscaping and construction.

Uses

Soil—Polyester fabric can be used to separate and/or filter pollutants, to protect products and walkways from the elements, and to provide drainage and thus prevent soil erosion.

Construction—Fabrics such as glass filament fibers, plastic, and acrylic are used to reinforce embankments, help prevent roadway cracking, provide adequate drainage, and prevent erosion.

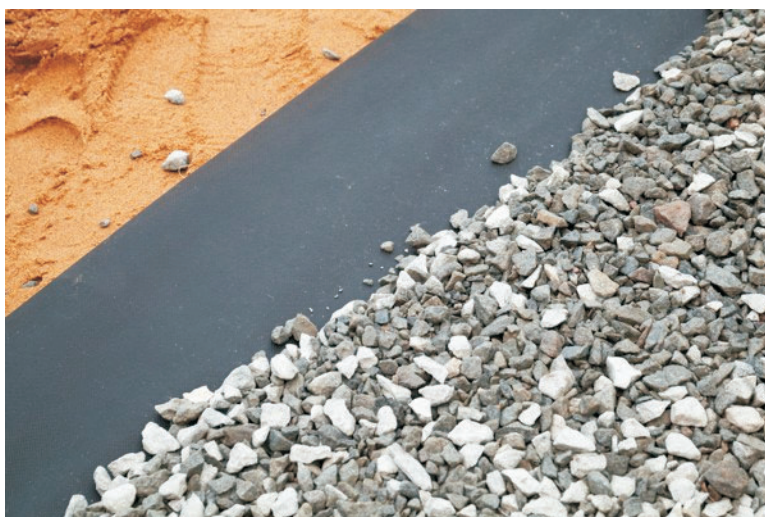


FIGURE 5. How is a textile being used in this roadway construction project? What purpose does the fabric serve?

Homotech

Homotech is a textile trend category that focuses on technical textiles used for the interior and exterior of the home.

Uses

Interior decoration—Fabrics such as, but not limited to, paper, wood or bamboo, wool, cotton, linen, rayon, polyester, and plastic are used for wall and floor coverings, carpeting, insulation, upholstery, curtains, linens, and floor padding.

Exterior decoration—Weatherproof fabrics can be used for outdoor furniture upholstery, outdoor decorative pillows and cushions, shades and awnings, outdoor patio umbrellas, and roofing materials.



FIGURE 6. How are textiles used in this outdoor lounge area at a tropical resort?

Indutech

Indutech is a textile trend category that focuses on technical textiles used for industrial purposes, such as conveyor equipment, filtration systems, silkscreen printing, plasma screens, and insulation materials.

Uses

Silkscreen printing uses woven and nonwoven fabrics in the production of garments, decals, posters, and display stands. For example:

- ◆ **Flocking** is a technique used to add texture to the surface of almost any textile and is created by depositing several small fibers on the surface, giving it a brush-like appearance.
- ◆ **Foiling** is a technique that involves printing a pattern with foil on fabric to give the fabric a metallic or shiny appearance.
- ◆ **Expanding ink** is a technique that uses a special ink to give fabric a 3D raised effect; also known as puff printing.
- ◆ **Glossing** is a technique for adding a clear base to a printed material to give it a shiny appearance.

Plasma is a synthetic textile made of gas and found in household items, such as television screens.

Lifting and conveying equipment includes conveyor belts made of woven polyester, cotton, nylon, plastic, PVC, or rubber.

Insulation fabric is used to control sound and vibrations in acoustic wall panels and other wall coverings, ceiling tiles, flooring, and doors.

Filtration systems use woven and nonwoven filters for air purification. These filters can be made from paper, fiberglass, foam, or fabric (e.g., cotton) and are used to filter dirt and dust from the air. Woven and nonwoven filters are also used in water and sewage plants to filter out dirt and debris.



FIGURE 7. This is an interesting soundproofing installation at First Ascent, Chicago. The installation is not only aesthetically pleasing, but it also serves a functional purpose: to provide a barrier for vibration and noise from the heating and cooling ducts. (Courtesy, Fabric Images, Inc., Elgin, IL)

Mobiltech

Mobiltech is a textile trend category that focuses on technical textiles used in the interiors and exteriors of various forms of transportation, such as automobiles, spacecraft, trains, ships, and aircraft.

Uses

Automobiles

- ◆ Interiors: Car interiors use woven and nonwoven fabrics, such as vinyl, leather, cotton, and polyester, for seat coverings, sidewall and ceiling coverings, air bags, seat belts, carpeting or flooring, sun visors, and air filters. Foams and polyester fiber fillings are found in the seat cushions and backs of car seats, as well as in head rests.
- ◆ Exteriors: Car exteriors use woven and nonwoven fabrics, such as rubber, fiberglass, plastic, and metals, for tires, windows, frame, and bumpers.

Spacecraft—The Space Shuttle and other spacecraft contain carbon fiber composites and heat-resistant shields made from woven and nonwoven textiles. The seat belts, flotation devices, and seat coverings are also made from textiles.

Trains—Trains use textiles, such as plastic, wood, aluminum, steel, glass, and leather, throughout the interior and exterior. Textiles are also found in the wall and floor coverings, seat belts, chair coverings, window treatments, and linens.

Ships—Vessels use woven and nonwoven textiles, such as plastic, fiberglass, polyester, plastic, cotton, and foam, for wall and floor coverings, seat coverings, flotation devices, window treatments, and the exterior make-up of the ships.

Aircraft—Airlines and the military use fabrics, fiberglass, metal, and rubber in aircraft for wall and floor coverings, seat coverings, flotation devices, seat belts, air masks, and other items.

Packtech

Packtech is a textile trend category that focuses on technical textiles used for packing and packaging purposes, such as storage containers and insulated shipping materials.

Uses

Storage—Containers, silos, soft luggage, lightweight mailbags, laundry bags, and storage sacks are composed of woven and nonwoven textiles.

Packaging—Shipping materials include nonpaper, twine, string, food soaker pads, and net-style packaging textiles.

Protech

Protech is a textile trend category that focuses on technical textiles that improve safety or that protect lives in high-risk workplaces or occupations or in other life-threatening situations.

Uses

Kevlar® is bulletproof material made from a synthetic fiber (Aramid) that is woven and usually layered with resin. This process produces a lightweight fabric that is stronger than steel and is virtually cut-resistant and bulletproof. Kevlar® vests are used by the military and by police officers to trap bullets and reduce life-threatening injuries. Gloves made of Kevlar® are

used in industrial settings: lumberjacks, chefs, butchers, fishers, landscapers, and builders wear them to protect their hands from cuts and excess heat.

Heat-resistant clothing is worn by firefighters, racecar drivers, and astronauts. **Heat-resistant** is a characteristic of clothing that prevents heat transfer and withstands high temperatures.

Masks and gloves are made from woven and nonwoven fabrics and are used in many occupations, including welding, culinary arts, and medicine. The gloves, usually woven types, are cut-resistant, sterile, and/or durable.

Disposable clothing (e.g., hospital gowns) is typically constructed from nonwoven fabric. However, HazMat (short for *hazardous material*) suits or coveralls worn by emergency crews, researchers, firefighters, and others may be made from woven and nonwoven materials.

Life-saving devices, such as artificial kidneys, arteries, or hearts, are made from woven and nonwoven textiles.

First-aid devices, such as bandages, casts, and sutures, are made from woven fibers and fabrics.



FIGURE 8. Kevlar® is bulletproof material made from a synthetic fiber called Aramid.

Sporttech

Sporttech is a textile trend category that focuses on technical textiles used for sportswear, workout attire, and athletic equipment. “Smart fabrics” are those textiles that are combined with technology.

Uses

Attire that measures an athlete’s biometrics, such as heart rate, breathing rate, body temperature, workout speed and intensity, pelvic rotation, and stride length, is made from smart fabric, as are sleep sensors and muscle sensors. Sports attire may also have finishes added to make it waterproof, sweatproof, and more durable.

Sports machinery, surface treatments, artificial turf, and equipment to measure biomechanics all use one or more forms of textiles made from plastic, nylon, rubber, or other fibers.



FIGURE 9. This athlete is wearing a biometric vest to capture data during a workout.

CURRENT TEXTILE TRENDS

Building Construction

Sheet metal textiles are trending in building construction because they are a cost-efficient option with less waste than traditional sheet metal products. The trend calls for one large fabricated piece of metal instead of several sheets of metal welded together, as in the traditional construction method. Time and labor are saved during construction.

Home and Commercial Sensors

Energy-efficient textiles are trending in building and home textiles. Sensors are being added to textiles to automatically detect carbon dioxide levels and then adapt to counteract those levels. Sensors for climate control are also added to textiles. Wearable textiles with sensors are also trending.

Permanent Modular Construction

Buildtech and Hometech industries are using modular construction techniques. These techniques have proven to increase productivity by saving both time and money. Entire wall panels, flooring systems, and ceiling systems are fabricated prior to construction and need only be fitted together and properly sealed.

3D Textile Printing

Clothtech, Hometech, and Sporttech technical textiles are created with 3D printing technology. These 3D products are more sustainable than traditional textiles and save gallons of water by using heat transfer instead of water or chemical transfer to complete the processing.

GPS and Smart Textiles

GPS tracking is trending in Clothtech and Sporttech. Smart fabrics are trending in the majority of technical textiles but especially in Hometech, Sporttech, and Clothtech. **Smart textiles** are fabrics created with new technologies that add value to the wearer: communication, transformation, energy conduction, and the ability to grow. Smart fabrics are able to:

- ◆ Measure climate control
- ◆ Adapt to light, heat, or sound
- ◆ Measure toxins in the air
- ◆ Alter color and texture
- ◆ Contain self-cleaning properties
- ◆ Measure biometrics (e.g., heart rate, metabolic rate, posture, and stride length)
- ◆ Eliminate unpleasant smells and/or simply give off pleasant smells



FURTHER EXPLORATION...

ONLINE CONNECTION:

Sustainable Products Made from Coffee Grounds

Coffee is one of the most popular beverages in the world. It is made from ground beans of the *Coffea* plant. Once brewed, most people throw the grounds into the trash can or down the garbage disposal. But a few companies are turning those grounds into sustainable products. S. Café is a company that spins coffee grounds into yarn to make athletic apparel. Re-worked is a company that turns coffee grounds into furniture. See more sustainable products made from recycled coffee on the Inhabitat website at <http://inhabitat.com/6-amazing-products-made-almost-entirely-from-recycled-coffee-grounds/>.



What do you do with used coffee grounds?

Sustainable Fabrics

Organic, reused, repurposed, or recycled fabrics are being used in all areas of technical textile production. Fibers are spun from milk, fermented tea, and coffee grounds, as well as from plastic and glass bottles. By using more sustainable products, textile producers are attempting to limit the amount of raw materials and to omit toxins produced during textile production or at least limit the amount of toxins released into the environment.

Robotics and Autonomous Machines

These technologies are trending, especially in Agrotech, Buildtech, and Mobiltech applications. For example, **geotextiles** are porous fabrics used to add soil stability, erosion control, and/or drainage for roadways, drains, ditches, harbors, and breakwaters. Another example is robots produced of technical textiles that are used to load and unload materials, to construct seed planters and fertilizer applicators, and for elements of farm combines.

Summary:



Textiles serve many purposes, both functional and aesthetic. Technical textiles are manufactured to serve a functional purpose and are used for indoor and outdoor products. Over time, textile advances have included color, types of fabric, style, function, and sustainability. Think of all the uses of textiles discussed in this E-unit: building construction, architecture, fabric displays, soundproofing structures, clothing, agriculture, landscaping, roadway construction, home interiors and exteriors, transportation, packaging, safety and protection, and sporting attire and equipment. Textiles and technology are a powerful combination.

Checking Your Knowledge:



1. What are technical textiles?
2. What are three functions of technical textiles?
3. What are textile trends?
4. List five industries that use textiles.
5. What interests you about “smart textiles”?

Expanding Your Knowledge:



What does the future hold for “smart textiles”? What makes smart fabrics so revolutionary? What are examples of performance-enhancing textiles? How is the health and beauty industry utilizing smart fabrics? Read more at “What Is the Future of Fabric?” in the Web Links section.

Web Links:



Know Your Materials: What Each One Means for Sustainable Fashion

<http://www.manrepeller.com/2016/06/sustainable-fashion-materials.html>

Smart Textiles Industry Trends and Market Segment Forecasts to 2020

<http://www.innovationintextiles.com/smart-textiles-industry-trends-and-market-segment-forecasts-to-2020/>

Technical vs. Traditional Textiles

<http://www.teonline.com/knowledge-centre/technical-textiles-industry.html>

What Is the Future of Fabric?

<http://www.forbes.com/sites/forbesstylefile/2014/05/07/what-is-the-future-of-fabric-these-smart-textiles-will-blow-your-mind/#2f48b83a4914>